

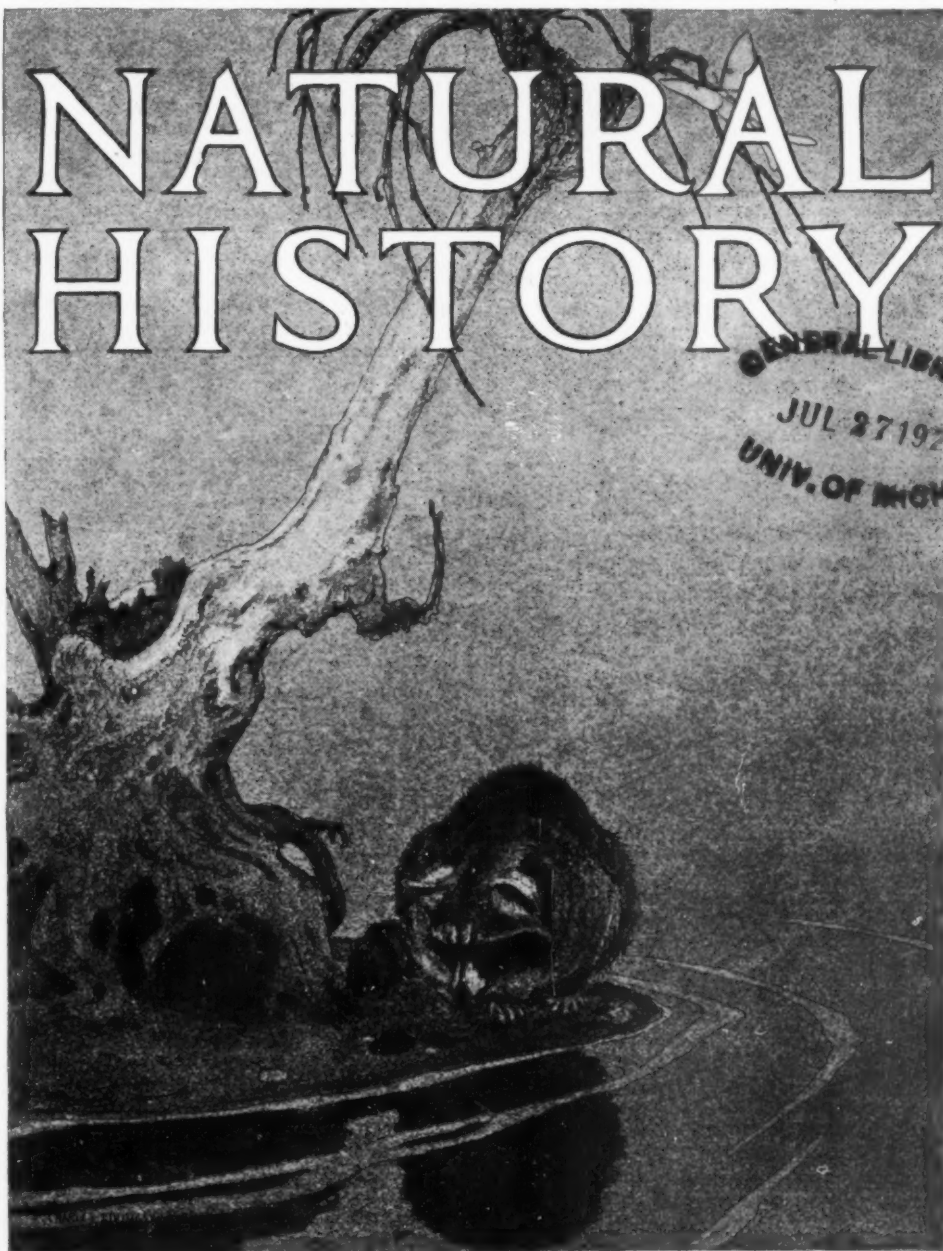
Vol. XXI

MARCH-APRIL, 1921

No. 2

NATURAL HISTORY

GENERAL LIBRARY
JUL 27 1921
UNIV. OF MICH.



JOURNAL OF THE AMERICAN MUSEUM OF NATURAL HISTORY

The American Museum of Natural History

BOARD OF TRUSTEES

HENRY FAIRFIELD OSBORN, President
CLEVELAND H. DODGE, First Vice President
J. P. MORGAN, Second Vice President
HENRY P. DAVISON, Treasurer
ADRIAN ISELIN, Secretary
GEORGE F. BAKER
FREDERICK F. BREWSTER
THOMAS DEWITT CUYLER
WALTER DOUGLAS
CHILDS FRICK

MADISON GRANT
WILLIAM AVERELL HARRIMAN
ARCHER M. HUNTINGTON
ARTHUR CURTISS JAMES
WALTER B. JAMES
CHARLES LANIER
OGDEN MILLS
PERCY R. PYNE
THEODORE ROOSEVELT
JOHN B. TREVOR

FELIX M. WARBURG

JOHN F. HYLAN, MAYOR OF THE CITY OF NEW YORK
CHARLES L. CRAIG, COMPTROLLER OF THE CITY OF NEW YORK
FRANCIS D. GALLATIN, COMMISSIONER OF THE DEPARTMENT OF PARKS

GEORGE H. SHERWOOD, Executive Secretary

SCIENTIFIC STAFF

FREDERIC A. LUCAS, Sc.D., Director

Geology and Invertebrate Palaeontology

EDMUND OTIS HOVEY, Ph.D., Curator
CHESTER A. REEDS, Ph.D., Associate Curator of Invertebrate Palaeontology

Mineralogy

HERBERT P. WHITLOCK, C.E., Curator
GEORGE F. KUNZ, Ph.D., Research Associate, Gems

Woods and Forestry (Curatorship Vacant)

Lower Invertebrates

HENRY E. CRAMPTON, Ph.D., Honorary Curator
ROY W. MINER, A.B., Associate Curator (In Charge)
WILLARD G. VAN NAME, Ph.D., Assistant Curator

FRANK J. MYERS, Research Associate, Rotifera
A. L. TREADWELL, Ph.D., Research Associate, Annulata

Entomology

FRANK E. LUTZ, Ph.D., Curator
A. J. MUTCHLER, Assistant in Coleoptera
FRANK E. WATSON, B.S., Assistant in Lepidoptera
JOSEPH BEQUAERT, Ph.D., Assistant in Congo Zoology

CHARLES W. LENG, B.S., Research Associate, Coleoptera
HERBERT F. SCHWARZ, A.M., Research Associate, Hymenoptera
WILLIAM M. WHEELER, Ph.D., Research Associate, Social Insects

Ichthyology

BASHFORD DEAN, Ph.D., Honorary Curator
JOHN T. NICHOLS, A.B., Associate Curator of Recent Fishes
E. W. GUDGER, Ph.D., Associate in Ichthyology

Herpetology

G. K. NOBLE, A.M., Assistant Curator (In Charge)

Ornithology

FRANK M. CHAPMAN, Sc.D., Curator
W. DEW. MILLER, Associate Curator
ROBERT CUSHMAN MURPHY, D.Sc., Associate Curator of Marine Birds
JAMES P. CHAPIN, A.M., Assistant Curator, African Birds
LUDLOW GRISCOM, M.A., Assistant Curator

Mammalogy

J. A. ALLEN, Ph.D., Honorary Curator
ROY C. ANDREWS, A.M., Associate Curator of Mammals of the Eastern Hemisphere
H. E. ANTHONY, A.M., Associate Curator of Mammals of the Western Hemisphere

HERBERT LANG, Assistant Curator, African Mammals
CARL E. AKELEY, Associate in Mammalogy

Vertebrate Palaeontology

HENRY FAIRFIELD OSBORN, LL.D., D.Sc., Honorary Curator
W. D. MATTHEW, Ph.D., Curator
WALTER GRANGER, Associate Curator of Fossil Mammals
BARNUM BROWN, A.B., Associate Curator of Fossil Reptiles
WILLIAM K. GREGORY, Ph.D., Associate in Palaeontology

Comparative Anatomy

WILLIAM K. GREGORY, Ph.D., Curator
S. H. CHUBB, Assistant in Osteology

J. HOWARD MCGREGOR, Ph.D., Research Associate in Human Anatomy

Anthropology

CLARK WISSLER, Ph.D., Curator
PLINY E. GODDARD, Ph.D., Curator of Ethnology
ROBERT H. LOWIE, Ph.D., Associate Curator of Ethnology
N. C. NELSON, M.L., Associate Curator of North American Archaeology
HERBERT J. SPINDEN, Ph.D., Associate Curator of Mexican and Central American Archaeology
CHARLES W. MEAD, Assistant Curator of Peruvian Archaeology
LOUIS R. SULLIVAN, A.M., Assistant Curator, Physical Anthropology

CLARENCE I. HAY, A.M., Research Associate in Mexican and Central American Archaeology

Comparative Physiology

RALPH W. TOWER, Ph.D., Curator

ALESSANDRO FABBRI, Research Associate, Physiology

Public Health

CHARLES-EDWARD AMORY WINSLOW, D.P.H., Curator

Public Education

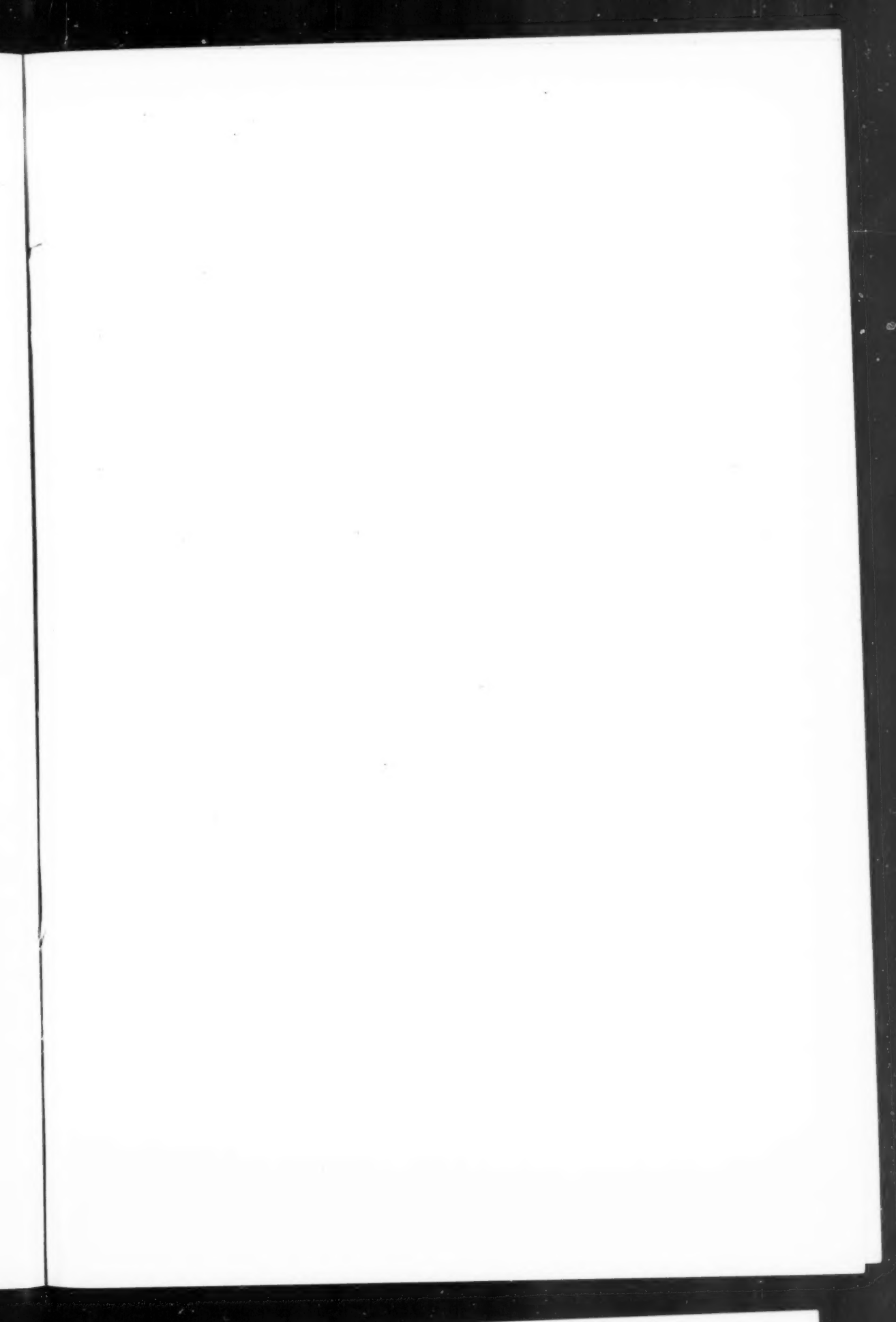
GEORGE H. SHERWOOD, A.M., Curator
G. CLYDE FISHER, Ph.D., Associate Curator
RUTH E. CROSBY, B.A., Assistant Curator
GRACE E. FISHER, Assistant

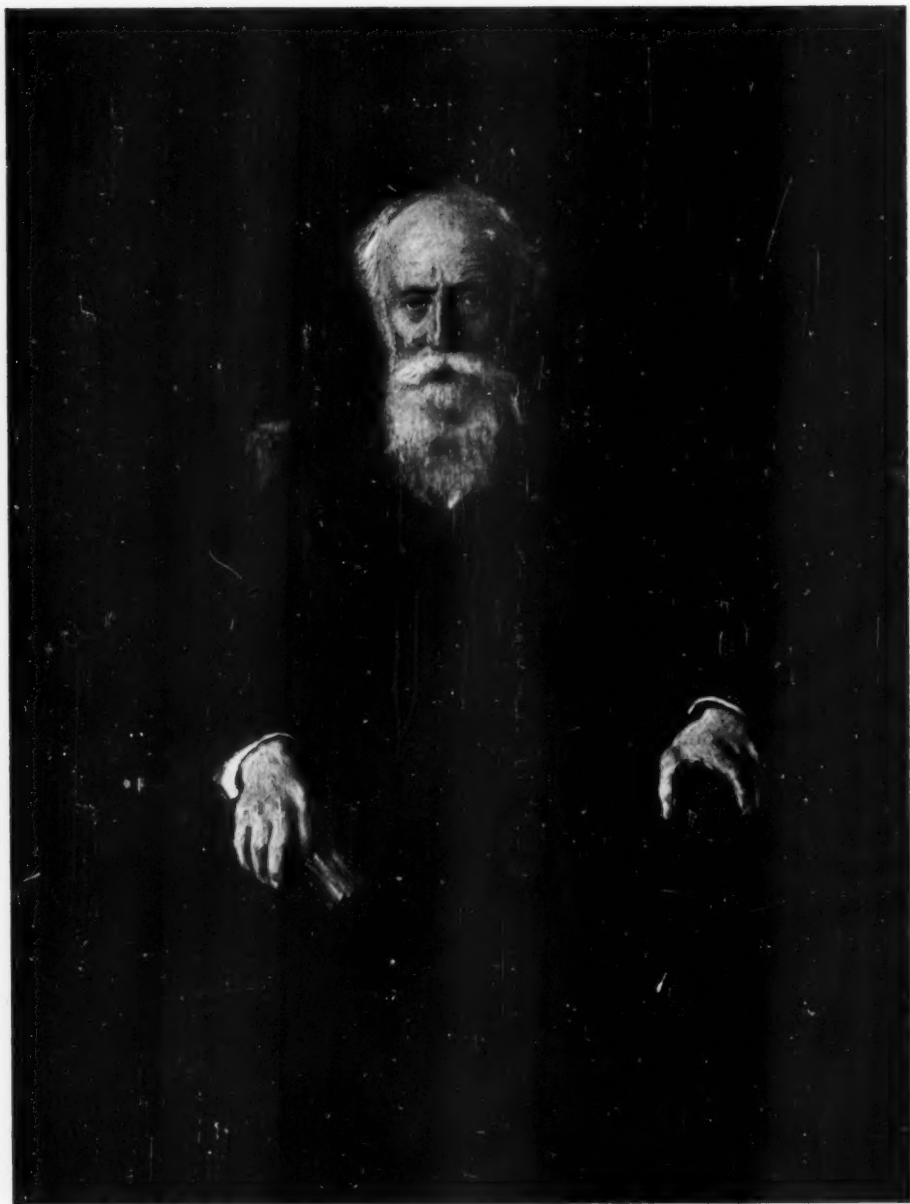
Library and Publications

RALPH W. TOWER, Ph.D., Curator
IDA RICHARDSON HOOD, A.B., Assistant Librarian

Preparation

LAURENCE VAIL COLEMAN, M.A., Chief





JOHN BURROUGHS

From his portrait by Her Serene Highness, the Princess Lwoff. Shown by courtesy of the artist

NATURAL HISTORY

VOLUME XXI

MARCH-APRIL, 1921

NUMBER 2

REMINISCENCES OF JOHN BURROUGHS

BY

G. CLYDE FISHER*

SOME twenty years ago there fell into my hands the first volume of Mr. Burroughs' essays that I had ever seen. It happened to be *Signs and Seasons*. I am now sure that the result would have been the same, had it been any other volume. The interest and charm that this book held for me prompted me to secure and read the others that he had written up to that time, and to be on the look-out for those that have come from his pen since. One cannot read any book by Mr. Burroughs without a feeling of affection for the author. He has put his lovable self into his essays in a way that few men of letters have succeeded in doing.

As my interest and admiration grew, I ventured to hope that I might sometime have the privilege of knowing him personally. On my first visit to New York, eighteen years ago, what I wanted to do more than anything else was to visit the Sage of Slabsides. So I went up to Riverby, his home, which is situated on the west bank of the Hudson about eighty miles north of New York City. It will not be difficult to imagine my disappointment when I was informed by Mrs. Burroughs, who came to the door, that her husband had gone to Slide Mountain, the highest peak in the Catskills, and would not return for several days. I could not wait, so had to leave without seeing him. Like a thoughtless schoolboy, I had neglected to find out beforehand whether he would be at home and whether it would be convenient to have me call. However, I

saw Riverby, the stone house, the building of which he describes in the essay "Roof-Tree," which is included in the first book of his that I had read. Here he makes us feel the joy he felt and the enthusiasm he had in building his home by the river.

It was not until after I joined the staff of the American Museum eight years ago, that I actually had the privilege of meeting the poet-naturalist, and later of visiting him at Riverby. This first visit was on a bright November day in 1915, an ideal day for such a pilgrimage. Mrs. Fisher and I were to be the guests of Dr. Clara Barrus, Mr. Burroughs' physician and friend, while we visited our hero. Mr. and Mrs. Burroughs were then living in the stone house at Riverby, but were taking their meals with Dr. Barrus, who lived in The Nest on adjoining grounds. This cottage, which Dr. Barrus on making her home there had rechristened The Nest, had been built for Mr. Burroughs' son, Julian. It is one of the most attractive little houses I have ever seen. There is no varnish or paint or veneer anywhere. The naked beams and ceilings of chestnut, the wainscoting of curly birch and other woods that had grown on the surrounding hills, the panels of white birch with the bark intact,—all these reminded one of what Mr. Burroughs had written in "Roof-Tree:"

"The natural color and grain of the wood give a richness and simplicity to an interior that no art can make up for. How the eye loves the genuine thing;

*Associate Curator, Department of Public Education, American Museum

how it delights in the nude beauty of the wood!"

The fine, large fireplace in the living-room, shown in the photograph on page 123, makes it complete.

When reading *John Burroughs—Boy and Man* by Dr. Barrus, I was much interested to learn President Roosevelt's reaction when he stepped into the big living room of this cottage in the summer of 1903—how he rushed out, calling to Mrs. Roosevelt, "Come here, Edith! I want you to see this—something original, and American."

Knowing that Mr. Burroughs did his writing in the forenoons, we proposed not to disturb him until lunch time. He had said, "My mind works best, and my faith is strongest, when the day is waxing and not waning." He was not a burner of midnight oil.

I had brought my camera hoping to get one picture of the great poet-naturalist. Before noon I started out to secure a few photographs about his home. First I undertook to make one of the Summer House on the banks of the Hudson just a few steps from the bark-covered Study between the stone house and the river. In this Summer House, which commands a wonderful view up and down the river, Mr. Burroughs used to sit by the hour during the warmer months of the year, reading or thinking out the essays he has given us. While focusing my camera on the Summer House, I was discovered by Mr. Burroughs, who appeared at the door of his Study, and after cordially greeting me, said, "I thought you might like to have me in the picture." I was so delighted that I could hardly operate my Graflex camera. However, I made a picture of John of Birds examining a wren box on the big sugar maple by the Summer House, one of him standing in the door of the Study looking out over the Hudson, and one of him sitting by the fireplace in the Study. So, my wish was more than fulfilled on that first visit.

The Study is a most interesting place,

a beautiful little one-room building lined with books, with here and there on the wall a portrait of a friend. Among these photographs were those of Emerson, Muir, and Whitman. At one end is a large fireplace, the chimney of which is made of cobblestones. In this Study before Slabsides was built, Mr. Burroughs wrote many of his essays, and since that time has written there during the winter months.

In the orchard at Riverby, there were a few of "the gentle but sharp-nosed gillyflower" or sheep-nose apples still hanging on one of the trees, apparently unharmed by whatever frosts had come previous to November 6. These reminded us of one of Mr. Burroughs' most delightful essays, "The Apple," which was published in his second nature book, *Winter Sunshine*.

"A rose when it blooms, the apple is a rose when it ripens. It pleases every sense to which it can be addressed, the touch, the smell, the sight, the taste; and when it falls, in the still October days, it pleases the ear. It is a call to a banquet, it is a signal that the feast is ready."

"The apple is indeed the fruit of youth. As we grow old we crave apples less. It is an ominous sign. When you are ashamed to be seen eating them on the street; when you can carry them in your pocket and your hand not constantly find its way to them; when your neighbor has apples and you have none, and you make no nocturnal visits to his orchard; when your lunch basket is without them, and you can pass a winter's night by the fireside with no thought of the fruit at your elbow,—then be assured you are no longer a boy, either in heart or in years."

Mr. Burroughs' love of the apple is not completely expressed in that early essay, for in his volume of verse, *Bird and Bough*, published many years later, one of the best poems is "In Blooming Orchards." One of his later books, which was written in the orchard

back of Woodchuck Lodge, although not expressing any of his thoughts about the apple, is entitled *Under the Apple Trees*.

Several acres of the grounds at Riverby are devoted to a vineyard, and especially during the early years of his residence there Mr. Burroughs spent considerable time growing grapes, by which activities he gained the nickname, "The Vine-dresser of Esopus." Before the development of West Park, the village of Esopus was his post-office address. On a subsequent visit he told me how men and boys were in the habit of pilfering his vineyard at night, and how some, not content with what they could eat at the time, carried away large quantities in row-boats across the Hudson. So, one night he concluded to watch. He put on a long black coat, and sat down in the vineyard for a period of "watchful waiting." He had not long to wait before three boys came down the road on bicycles. Laying their wheels by the roadside, they climbed over the fence into the vineyard and began sampling the luscious grapes. Mr. Burroughs got up and walked slowly down between the rows of grapes toward the boys, who soon spied him and started to run, the owner of the vineyard after them. Two of the boys reached the fence, scaled it, mounted their wheels, and rode off. The third was not so fortunate. "Just as he was going over the fence," said Mr. Burroughs, "I caught him by the leg. He let out an unearthly yell, and as I did not want to scare him to death let him go." The boy picked up his bicycle and hurriedly attempted to mount it, but in his excitement, he fell off. Then he jumped to his feet and abandoning his wheel, ran down the road after his companions. The next morning the owner of the wheel returned and begged for it, declaring that he had never been in the vineyard before and would never enter it again. Leading him down to the vineyard, Mr. Burroughs presented him with a hatful of

grapes to take home and restored to him his bicycle.

At luncheon, in deference to my training, Mr. Burroughs told us about some of the botanical rarities he had found in the vicinity—the showy lady's-slipper, climbing fumitory or mountain fringe, and others, the finding of which he so vividly describes in the volume of outdoor essays entitled, *Riverby*. Since his first discovery of mountain fringe, it has become a common plant around Slabsides. Last November, on the anniversary of our first visit, we found it blooming in profusion around that cabin.

After luncheon, Mr. Burroughs conducted us up to Slabsides—which is located about a mile and three quarters in a westerly direction from Riverby. After leaving the main highway, we followed a somewhat winding woods road which led through a beautiful stretch of hemlock forest. As we walked along, Mr. Burroughs would occasionally pluck a gorgeous oak leaf from a young tree and, holding it between his eye and the sun, would comment on its beauty. I never realized until then how much more beautiful an autumn leaf is by transmitted light than by reflected light.

On the way we flushed a ruffed grouse, or partridge, from the road in front of us, and it whirled away through the woods. We were all delighted with this glimpse of wild life. As Mr. Burroughs watched its flight he said, "I hope it will escape the gunners this fall." Subsequent visits to Slabsides have shown that there are ruffed grouse still to be found about this cabin. Late in May two or three years after this first visit, I surprised a mother ruffed grouse and her family of downy young on this very road. It is to be hoped that the woods about Slabsides will be made a permanent sanctuary, so that the birds, which meant so much to Mr. Burroughs and about which he has written so charmingly, may be found there always.

Slabsides is so well hidden by the natural conformity of the encircling



Lover of children.—A human, kindly man with a warm spot in his heart for children, and the children returned his love. This baby, ordinarily reserved toward strangers at the time of her first visit immediately showed full confidence in Mr. Burroughs



The Sage of Slabsides.—At the table where Burroughs wrote *Wait Whitman: a Study* and many of his outdoor essays. The last photograph ever made of him in Slabsides—November 7, 1920. He was at Slabsides but once after this date



John and Demijohn.—John Burroughs and his only grandson, John Burroughs 2d, of whom he was pardonably proud, for the younger John is a chip of the old block, once removed, being fond of camping and tramping and other outdoor activities

hills, that one comes almost upon it before seeing it. We reach the cabin and notice how it is sheltered under the brow of a steep, rocky cliff (see illustrations in *NATURAL HISTORY*, December, 1919, p. 576, and November-December, 1920, p. 572). The weather boarding is made of slabs with the bark still on,—hence the name. At the south end is a stone chimney connecting with the huge fireplace within. Inside, Slabsides, by virtue of its rustic furniture and its partitions of yellow birch with the beautiful bronze-colored bark still on, is even more attractive than outside. There were rustic hickory chairs, and two wonderful rustic beds, with old-fashioned coverlets which Mr. Burroughs' mother had had made. The bed on the first floor is built into the house and has a substantial, comfortable look. The one in the south room up-stairs is even more picturesque. It is made chiefly of bark-covered yellow birch, the upright pieces at the head being water beech (*Carpinus*).

The legs of the table upon which Mr. Burroughs wrote many of his essays are tridents of staghorn sumac. He told me that inverted, symmetrical tripod-formations were to be found more frequently in staghorn sumac than in any other of our trees or shrubs.

Mr. Burroughs had an eye for the picturesque in the natural forms to be found in the trees. This is evidenced many times in his mountain cabin,—by the arm at the end of a window seat; by the spiral-shaped crosspiece above the fireplace, caused by the strangling by bittersweet or some other twiner; by the peculiar, X-shaped pine root over the door of the bedroom down-stairs. This last and another similar to it, which lies back of the front door in the living room, were dug up when the swamp just south of the cabin was drained.

For the best description of Slabsides that has been written, read two chapters in *Our Friend, John Burroughs*, by

Clara Barrus,—one entitled "The Retreat of a Poet-Naturalist" and the other "A Winter Day at Slabsides." These suggest the atmosphere of the place and give much of the man who tarried there.

Mr. Burroughs built Slabsides in 1895, to get away from the annoyances of civilization. At Slabsides, on this first visit I asked Mr. Burroughs about a number of distinguished visitors he had had there. Dr. Chapman of the American Museum had gone to see him when he was clearing the ground for the rustic cabin, and was one of his earlier visitors after the cabin was built. These pilgrimages were written up in the first number of the first volume of *Bird-Lore* and in a chapter in *Camps and Cruises of an Ornithologist*. Whenever I went to see Mr. Burroughs, he always asked about Dr. Chapman.

His friend, Walt Whitman, visited him where Slabsides was subsequently built, and wrote a vivid description of Black Creek and the surrounding region, which was later printed in *Specimen Days*. Black Creek, whose falls are within hearing of Slabsides, is a wild place where Mr. Burroughs used to go every May for warblers. More than once in May, since my first visit, I have tramped along this creek (in "Whitman Land") looking for warblers and finding them, too. All wild life about this mountain cabin is unusually interesting because it has been immortalized in the essays of the great naturalist.

John Muir was one of the earliest visitors to Slabsides. He came in 1897 and spent several days. After discussing the qualities and work of the Naturalist of the Sierras, Mr. Burroughs said, "Muir told us the story of Stickeen one night in Slabsides. We did not go to bed until one o'clock that night!" *Stickeen* is a fascinating story to read, but how much more impressive it would have been to have heard Muir tell this story, and in Slabsides with John Burroughs as one of the listeners! "*Stickeen*, by John Muir," said Mr. Burroughs,



John Burroughs and President Roosevelt watching an eruption of Old Faithful.—“At the time I made the trip to Yellowstone Park with President Roosevelt in the spring of 1903, I promised some friends to write up my impressions of the President and of the Park, but I have been slow in getting around to it. The President himself, having the absolute leisure and peace of the White House, wrote his account of the trip nearly two years ago! But with the stress and strain of my life at ‘Slabsides,’ administering the affairs of so many of the wild creatures of the woods about me,—I have not till this blessed season (fall of 1905) found the time to put on record an account of the most interesting thing I saw in that wonderful land, which, of course, was the President himself.” (From *Camping and Tramping with Roosevelt*.)

“will rank with *Rab and His Friends*, by Dr. John Brown, as one of the greatest dog stories of literature.”

Burroughs returned this visit a dozen

years later and Muir showed him the Grand Cañon and the Yosemite.

I asked Mr. Burroughs about the visit of President and Mrs. Roosevelt in July, 1903. They had come up the Hudson in “The Sylph” on the hottest day of the summer—96 degrees in the shade at Slabsides. The host and his guests walked from the river up to the mountain cabin. “How the President did perspire!” said Mr. Burroughs. At luncheon in Slabsides, although his cup had been filled with cold water from the spring near by, the President jumped up and helped himself several times during the meal. In discussing the strenuous life of the President, Mr. Burroughs said: “There is no dead wood in Roosevelt.”

Mr. Burroughs also related how he and President Roosevelt had gone birding one day at Pine Knot, Virginia, and how they had identified some seventy species of birds, two of which were new to the President and two of which were new to Mr. Burroughs. Had they found a Lincoln’s sparrow, which President Roosevelt had seen there before, and which Mr. Burroughs had never seen, the President would have been one ahead. He told about the difficulty they had in identifying a female blue grosbeak. Mr. Burroughs said, “Roosevelt knows the birds.”

Upon leaving Slabsides on that memorable day, I found an herb-robot in bloom, and plucking the little, red-purple flower, placed it between the leaves of the first volume of my set of Burroughs’ works, which I had brought along in order to ask Mr. Burroughs to inscribe it. When I reached home, I pressed the specimen and mounted it in the back of *Wake-Robin*, a suitable place, I thought, to preserve a flower plucked while walking with John Burroughs.

On the way back to Riverby from Slabsides, I expressed my appreciation to Mr. Burroughs for what he had done to stem the tide of sham natural history which was sweeping over the country



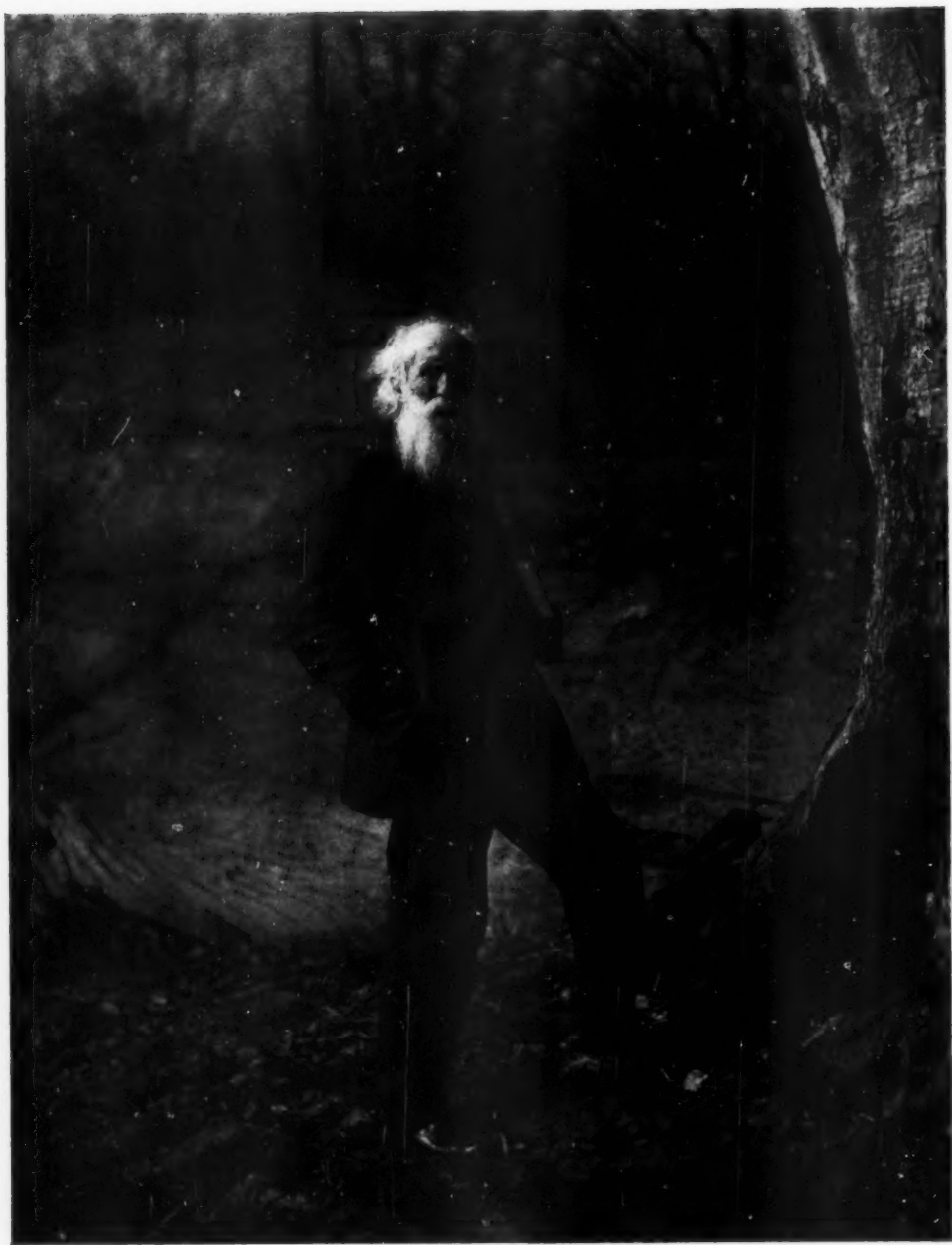
Deacon Woods where Burroughs saw his first warbler.—In the woods shown in the middle ground, John Burroughs, when a boy, saw his first warbler, and then many years later described the incident in "The Invitation," the last essay in *Wake-Robin*.

The notch in the mountains back of the Deacon Woods in this photograph is Montgomery Hollow where our naturalist in his boyhood went fishing with his grandfather.

It is probable that these early fishing trips, as well as the sight of that first warbler, had much to do with making him a naturalist



Whitman Land.—One of the falls on Black Creek near Slabsides, where the Good Gray Poet had visited the poet-naturalist before the famous rustic cabin was built. Near this spot, seated on a fallen tree, Whitman wrote a description of the place which was later printed in *Specimen Days*. (See *Our Friend, John Burroughs*, by Dr. Clara Barrus, p. 25)



JOHN BURROUGHS ON HIS EIGHTY-THIRD BIRTHDAY

"Lucky is he who can get his grapes to market and keep the bloom upon them, who can carry some of the freshness and eagerness and simplicity of youth into his later years, who can have a boy's heart below a man's head."

"The longer I live the more my mind dwells upon the beauty and wonder of the world." (From *The Summit of the Years*)

some twelve years before. He then told me how he had discovered the work of one of the most active and, at the same time, one of the most popular writers of this fake natural history. One of the books of this author had been highly recommended to Mr. Burroughs by a New York school teacher. Upon finding at a subsequent meeting that Mr. Burroughs had not yet read the book, this teacher offered to send him a copy. When he received it, Mr. Burroughs sat down expecting an enjoyable hour reading it. "But," said Mr. Burroughs, "I had not read ten minutes until I kicked out in the air—I just *had* to kick out against something, and I exclaimed, 'This writer is a humbug.'" His love of truth prompted him to write an article in the *Atlantic Monthly* for March, 1903, entitled "Real and Sham Natural History," which was directed against this sort of thing. Other naturalists, including Roosevelt and Chapman, took sides with Mr. Burroughs in this fight, and before long, they had about snuffed out the writer referred to, as well as others of his kind. As a result, these books of fake natural history have been ruled out of the lists of supplementary reading in many of the public schools of the country, and their harmful effects have been reduced to a minimum.

Since the days of that controversy, Mr. Burroughs said he had talked with people who know the writer above referred to, and that they had assured him that this writer actually believed the things he wrote. "So, now," said Mr. Burroughs, "I think of him as a mythomaniac."

Upon bidding farewell to his guests at the railroad station at West Park that evening, Mr. Burroughs said, "Whenever you want to come to Slabsides, the key is yours." In response to this generous invitation, we have camped in this mountain cabin, for two or three days at a time, about twice a year since that first visit. We have been there in May when the warblers were abundant,

and we have been there the last week in November, with the thermometer down to twenty at night, when, instead of warblers around the cabin, we had the winter wren, the junco, and the chickadee.

First things make lasting impressions, and so it is with my first visit with John Burroughs, but the visits that have meant the most to me have been subsequent ones. Perhaps the most inspiring have been those at Woodchuck Lodge on the home farm near Roxbury in the western Catskills, where for many years it has been his custom to spend his summers. The farm on which he was born is situated "in the lap of Old Clump," which has since been rechristened Burroughs Mountain. Woodchuck Lodge is only about a half mile distant from his birthplace. It gets its name from the abundance of woodchucks in the vicinity.

The country about Woodchuck Lodge is full of interest. In the apple orchard back of this cottage was located Bush Camp, where he wrote the collection of essays entitled *Under the Apple-Trees*. It is where he found out how the chipmunk digs its burrow, which he describes in the first essay of this volume. Up the road a little way is the barn which he used for a study when he wrote "A Barn-Door Outlook," "A Hay-Barn Idyl," and other essays. A little farther up the road toward the birthplace are the "Giant's Stairs," a natural stair-step formation, though crude—the steps being too high to be negotiated by a human being—hence the name, applied when he played there as a boy.

Across the road are many hour-glass-shaped thorn trees or haw trees (*Crataegus*) in every stage of development, which is influenced by the browsing of the dairy cows.

"The way the wild apple trees and the red thorn trees in the pasture, as described by Thoreau, triumph over the cattle that year after year browse them down, suggests something almost like

human tactics. The cropped and bruised tree, not being allowed to shoot upward, spreads more and more laterally, thus pushing its enemies farther and farther away, till, after many years, a shoot starts up from the top of the thorny, knotted cone, and in one season, protected by this *cheval-de-frise*, attains a height beyond the reach of the cattle, and its victory is won. Now the whole push of the large root system goes into the central shoot and the tree is rapidly developed." (*Ways of Nature*, p. 153.)

Immediately after the central shoot gets up beyond the reach of the cows the tree becomes strikingly hour-glass-shaped.

At the hay barn at Woodchuck Lodge, one day, Mr. Burroughs was discussing Thoreau, speaking very highly of the essays, "Walking" and "Wild Apples," both of which are included in *Excursions*. Then he referred to certain peculiarities, and to a number of surprising inaccuracies to be found in the writings of this author. "But," he said finally, "I would rather be the author of Thoreau's *Walden* than of all the books I have ever written."

While I do not sympathize with that statement, it must be admitted that Burroughs could hardly have paid a higher compliment to Thoreau. For myself, I would rather be the author of Burroughs' *Wake-Robin* than all I have ever read of Thoreau's works.

Nearby is the Deacon Woods where Mr. Burroughs, when a boy, saw his first warbler—a black-throated blue—originally described in *Wake-Robin*, in the chapter, "The Invitation." On my first visit to Woodchuck Lodge, as we walked past this woods on our way down to the birthplace, Mr. Burroughs retold this story to me. He said, "My brothers were with me, and they saw the bird; however, they did not remember it,—but it 'stuck in my craw.'" I often think how much the sight of that beautiful little warbler may have influenced him to become a naturalist; how much it

may have added to his natural bent; how much this and the early fishing trips to Montgomery Hollow with his grandfather may have had to do in preparing him for the influence that the Audubon books had upon him when he discovered them many years later in the library of the West Point Military Academy. It happens that Mr. Burroughs was the first person to find an occupied nest of the black-throated blue warbler, which had been his first warbler. This reminds us of other contributions to ornithology made by Mr. Burroughs, such as the finding of the first nest of the mourning warbler and the first description of the flight-song of the ovenbird. However, his actual discoveries in natural history are not his most important work. It is his literary interpretation of the common things about us,—in short, his books, that are his great legacy to mankind.

Near the birthplace is the sugar bush where Mr. Burroughs had made maple sugar from his early youth. He says the only farm work that appealed to him as a boy was sugar-making in the maple woods in spring.

From an autobiographical sketch in *Our Friend, John Burroughs*, we learn that here he earned his first money. Anticipating the general tapping a week or so, he would tap a few trees on his own account along the sunny border of the woods, and would boil the sap down on the kitchen stove, to the distress of the women folk as he said. Then he carried the small cakes of maple sugar to the village where they found ready sale, being the earliest on the market. He bought his first algebra and his first grammar with some of this precious money.

At his eighty-third birthday party at Yama Farms Inn I made several photographs of Mr. Burroughs boiling down maple sap, when he evidently thoroughly enjoyed showing his friends how he used to do it. (See photograph on page 123).

In the garden at Woodchuck Lodge,



By the fireside.—John Burroughs and Dr. Clara Barrus, his literary executor and biographer, in The Nest at Riverby



Boiling down maple sap.—John Burroughs making maple sirup at Yama Farms on his eighty-third birthday



A brigand steak.—The last one Burroughs ever cooked at Slabsides, November 7, 1920. (Photograph by Farida A. Wiley)

Mr. Burroughs raised peas, beans, golden bantam sweet-corn, Hubbard squashes, etc. At the time of one of my visits, he had two of the largest Hubbard squashes I had ever seen, and I had observed a great many, for they were a favorite product on the farm on which I was born and reared. Later, Burpee, who had furnished the seed, assured him in reply to a note telling of the weight, that the heaviest one was a record. (For photograph of Mr. Burroughs and one of these squashes, see NATURAL HISTORY, December, 1919, page 577). When I gave Mr. Burroughs a copy of this photograph, he said: "I sent that squash to Edison, and told him it was the largest squash Old Mother Hubbard ever had in her cupboard."

The Laird of Woodchuck Lodge was proud of his garden up there, but it would have been impossible to have had a garden if nothing had been done to hold the woodchucks in check. So Mr. Burroughs shot a great many of them. One day I asked him how many he had killed that season, and he replied that the number was more than forty and the season was not over. He said at times it did not appear to do any good,—that when he shot one, several others seemed to come to the funeral. However, he had a good rifle, and when he was past four score years, I have seen him hit them at surprisingly long range—at longer range than I would have cared to chance a shot. Sometimes he would trap them at their burrows. One morning we went out to inspect a trap that he had set, and when we reached the burrow, to our surprise and regret there was in the trap not a woodchuck but a skunk. If I should tell you what he said, you would know that he was human.

Out of the woodchuck skins he made rugs for Woodchuck Lodge, a coverlet for his bed on the sleeping porch, a great coat for himself, and a coat for Dr. Barrus. The coat he had made for himself now belongs to his son, Julian.

During the last few years woodchuck

became a favorite dish at Woodchuck Lodge. The fact that he learned to eat woodchuck so late in life proves that he had not grown old, that he was still as adaptable as a boy. And I want to say that when I ate woodchuck with John Burroughs, I liked it too.

At Woodchuck Lodge, I saw the home-made cradle in which John Burroughs had been rocked more than eighty years ago. It is made of apple wood and is painted a dull gray-blue.

As we slept on the porch one night, we heard just across the road from Woodchuck Lodge, the bark, or squall as Mr. Burroughs called it, of a red fox that had come down from the mountain. It was a delight to hear this wild voice of the night, especially when sojourning with the poet-naturalist who had given us such a faithful word-picture of Reynard in *Winter Sunshine*.

In "The Heart of the Southern Cat-skills," in *Riverby*, Mr. Burroughs describes his favorite valley in that range. Twice I had had a wonderful tramp in this, the Woodland Valley, along the brook where our naturalist friend had camped and tramped and fished for trout. Once I climbed Wittenberg and slept on its summit with his grandson, John Burroughs 2d. In like manner years before the elder had climbed it and slept on the top with a companion. On these tramps I had seen the painted wake-robin (*Trillium undulatum*) growing in great abundance, and I naturally suspected that this was the flower that had suggested the title for his first book. So, one morning in the kitchen at Woodchuck Lodge, while Mr. Burroughs was frying the bacon and making pancakes for breakfast, I asked him whether it was the painted wake-robin for which his first book was named. "No," he replied, "it was not, but it was the large-flowered white wake-robin (*Trillium grandiflorum*).

"I had several possible titles, and I took them to Walt Whitman. He looked them over, and when he came

to 'Wake-Robin,' he asked, 'What's that?' I told him it was the name of a wild flower. He then said, 'That's your title'—and this helped me to decide upon the name 'Wake-Robin.'

"After the book was published, in speaking to me about it, Emerson said, 'Capital title! Capital title!'"

At the close of a visit at Woodchuck Lodge, my host undertook to drive me in his Ford car to the railway station at Roxbury. We had not gone far when the car refused to go. I got out and pushed, thinking that, if I could move it to the brink of a slight incline, it would probably pick up and go again. Pushing an automobile is not child's play, and as I was not making rapid headway, my host got out to help me. I said, "Mr. Burroughs, you should not do this." He turned on me and quick as a flash replied, "Why shouldn't I?" He always retained the spirit of youth, and I had by implication accused him of being no longer young. I was reminded of this incident again when I read that classic on old age by William Dean Howells, entitled "Eighty Years and After."

My last visit with John Burroughs was during the week end of November 6-8, 1920, the first of these three days being the anniversary of my first visit. We

camped in Slabsides, and on the second day (November 7) Mr. Burroughs ate his midday meal and spent several hours with us. He cooked one of his favorite brigand steaks for luncheon—the last he ever cooked at Slabsides. While preparing the steak, we talked about his latest book, *Accepting the Universe*, which had appeared a little while before. He told me of a number of letters he had received concerning it, and that two or three preachers had thanked him warmly for writing such a book. (See review in *NATURAL HISTORY*, November-December, 1920.)

On the afternoon of that day, I made what proved to be the last photographs of him at Slabsides. In fact, he visited Slabsides only once after this date. We found the herb-robert in bloom near by, as we found it on my first visit. We also found the climbing fumitory or mountain fringe and the witchhazel in bloom.

When he left Slabsides toward evening, we walked with him to the bend of the road in the hemlocks, and there bade him good-bye. Little did we think that this would be the last time we would see him alive. While we shall not be able to talk with him again, or to shake his hand, or to look into his honest gray-blue eyes, he still lives in our hearts. The spirit of John Burroughs will live on.



Boyhood Rock.—"Here I climbed at sundown when a boy to rest from work and play, and to listen to the vesper sparrow sing, and here I hope to rest when my work and play are over—when the sun goes down—here by my boyhood rock." (See *John Burroughs—Boy and Man*, by Clara Barrus, M.D., p. 47).

The rock which marks Burroughs' last resting place lies in the pasture field on the old home farm near Roxbury in the western Catskills



STONE RUINS IN GUAM

The ruined stone pillars upon which the Chamorro natives built their houses in ancient times are found at various places in the "bush" of Guam and of other islands of the Mariana group. The retiring Governor of Guam and the new Governor are standing in the background

A JOURNEY TO THE MARIANA ISLANDS— GUAM AND SAIPAN¹

BY

HENRY E. CRAMPTON*

“**B**UT why go to Guam?” “Where is Guam?” Almost invariably these questions were forthcoming when plans were announced early in 1920 for a journey to our far-distant possession in the western Pacific Ocean. It is the object of the present article to answer such queries, and to describe the incidents of travel and observation during a sojourn of two months in the two most important members of the Mariana Group,—the American island of Guam, and the island of Saipan, now in the hands of Japan.

In its entire course, the expedition extended later to the Philippine Islands, China, Siam, Java, and Australia; its general purpose throughout was to gain fuller knowledge of the zoölogy and ethnology of the western Pacific and of the contiguous areas of Malaysia and Asia. The five expeditions that the author had made in former years to islands of the Pacific Ocean were concerned primarily with southeastern Oceania, or Polynesia in the stricter sense, where the Society, Cook, Tonga, and Samoan islands are situated; it is in this subordinate area that the material selected for special investigation is most abundant and most interesting,—namely, the land snails of the genus *Partula*, which have proved so valuable for the study of variation, distribution, and evolution.²

In view of the profitable nature of the Polynesian researches, still in progress, it seemed desirable to make a comparative exploration of the extreme northwestern part of the entire oceanic area occupied by the genus in question, that is, in Micronesia, or the “region of little islands,” where the Mariana

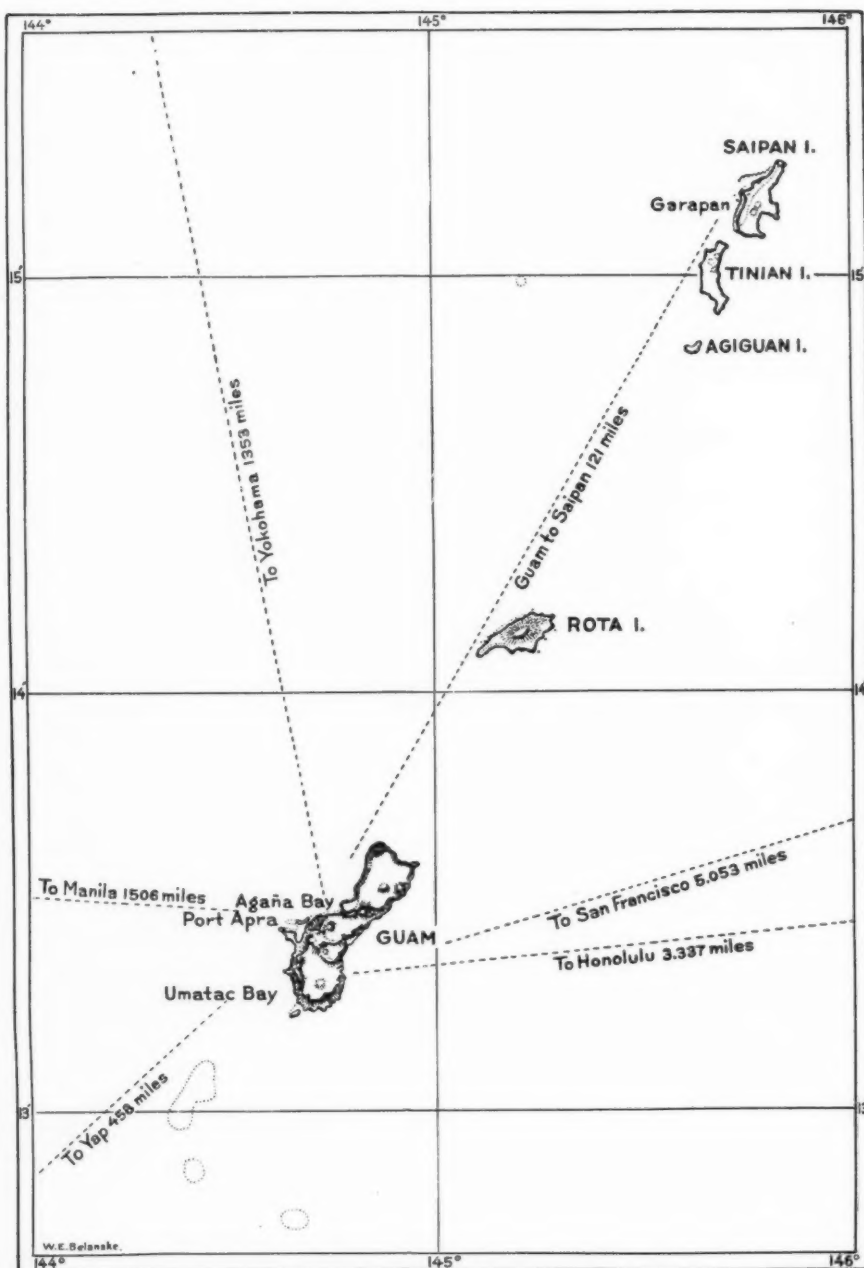
and Caroline Islands are the most important. In brief, therefore, Guam and Saipan were chosen for investigation in the direct continuity of the author’s special researches on evolution. Incidentally, of course, general zoölogical collections were to be made, in the interests of the American Museum and of the Bishop Museum in Honolulu as well, for the latter institution generously came to the support of the project, which was also assisted by Mr. James B. Ford and Mr. B. Preston Clark.

A word may be added with reference to the ethnological problems. The scientific traveler in Polynesia inevitably becomes deeply interested in the natives of the several groups of islands, whose distribution in the islands and evolution during the past are precisely the same in principle as in any group of lower organisms. The people of Tahiti, Rarotonga, Tonga, Samoa, New Zealand, and Hawaii are clearly related in ancestry, and the evidence of such relationship is provided by the fundamental likeness in physique, in language and in other cultural matters, beneath the diversities that are the results of recent differentiation. And in their common qualities the true Polynesians differ markedly from the natives of Fiji, the Solomon Islands, and the New Hebrides, whose black, Ethiopic qualities give to the southwestern region the subtitle of Melanesia; while, on the other hand, the Malayan features of the peoples of Micronesia separate them from the Polynesians and Melanesians, and ally them more closely with the natives of Malaysia and the Philippines. The traditions of the Polynesians tell of their origin long ago from a distant land, “Hawaiki,” which was probably

²See NATURAL HISTORY, Vol. XX, No. 4, Sept.-Oct., 1920.

*Honorary Curator of Lower Invertebrates, American Museum

¹Article and illustrations copyrighted by Henry E. Crampton, 1921



THE SOUTHERN ISLANDS OF THE MARIANA OR LADRONE GROUP

in southern Asia; and their migrations throughout the centuries traversed Malaysia and Melanesia, and possibly parts of Micronesia on the way to Hawaii. In view of these and similar facts, it was certain that the countries to be visited during the last expedition would yield, as they did, many interesting observations on the natives and their cultural characteristics which would indicate points of contact, linguistic relations, and other mutual influences in the centuries long past.

The Mariana Group consists of a chain of fifteen islands, together with a few coral banks and shoals, that spread out along a line about 420 miles in length. As a slightly curved bow, this line trends generally north and south; it extends from approximately 13° to 20° north latitude, and it lies between 144° and 146° east longitude. Guam is the southernmost and largest member of the group, and its approximate sailing distances from ports of primary interest in the Pacific are as follows: San Francisco 5053 miles, Honolulu 3337 miles, Yokohama 1353 miles, Manila 1506 miles, and Yap, in the neighboring Caroline Group to the south, 458 miles. Saipan lies about 120 miles north-northeast of Guam.

Many of the northern islands are smoking volcanic cones that are still growing; others have only recently ceased to be active, and some rise to heights of more than two thousand feet. Passing southward, the islands prove to be geologically older, and the evidences of volcanic origin are more or less effaced, while the limestone masses of ancient reefs, now uplifted as dry land, constitute the lower ground above which rise the weathered and truncated mountain peaks.

On June 26, 1920, our ship came in sight of the Marianas after the long voyage of three weeks from San Francisco, broken for a day or two by a stop at Honolulu. Practically the sole

means of reaching Guam is by transport, and through the good offices of the then Secretary of War, the Hon. Newton C. Baker, my family and I were privileged to travel on the United States Army transport "Logan," and to become acquainted with the genial company of officers of the Army and Navy, proceeding with their families to their distant posts in the Far East. A most fortunate circumstance was the presence on board of Captain Ivan C. Wettengel, U. S. N., and Mrs. Wettengel, whose aid during the following weeks was indispensable for the successful accomplishment of the scientific work, and whose hospitality made our sojourn delightful beyond any possible anticipation.

Almost at the same time, Guam and Rota, the smaller island to the north, emerged from the mists of the horizon, becoming ever more definite in form and green in color as the ship approached. We could well imagine the joy of Magellan and his crew when in 1521 they first discovered these islands during the famous voyage of circumnavigation of the globe, at a time when illness and shortage of food and water made their plight most serious. In Magellan's time, the people were notable sailors and exploiters of the sea, and as their sailing canoes put out to meet the newcomer, Magellan was so impressed by their craft that he named the group the "Islands of the Lateen Sails." When, however, he had anchored and obtained the much-needed provisions and water, his quondam hosts proceeded to steal various objects about the ship and the cordiality of their mutual relations disappeared. Magellan thereupon re-named the place the *Ladrones*, or "Islands of the Robbers"; and to this day the name is largely used, although for obvious reasons the people themselves do not approve of it. The Spaniards established their sway some decades later, missionaries of the Catholic Church began their work, and in the seventeenth century, the

group was named the Mariana Islands, in honor of Queen Maria Ana de Austria.

From our vessel, as we rounded the northern end of Guam, we could see much of the general character of the island. Guam is about thirty miles in length, and from four to seven miles in width. The northern half is relatively flat, and consists of limestone strata raised high above the sea and terminating in abrupt drab-colored cliffs. Dense, green forests cover this part of the island. Coming southward on the western side, we neared the Bay of San Luis de Apra, now called Apra Harbor for the sake of brevity, where the mountains of the southern half came into view. The upper ground does not bear so much vegetation of higher growth, save in restricted areas, but is covered for the most part with grasses of xerophytic nature. Coming to anchor, the launches put out to convey us to the landing port of Piti, whence by automobile we traversed the five miles of excellent road that follows the winding shore to Agaña, the principal town and the seat of government of the island. It seemed a veritable home-coming to be again in a tropical island, to pass by a plantation of graceful cocoanut palms, or a hedge of scarlet-flowered hibiscus, fronting a bungalow or a row of native houses. Yet even on first acquaintance, there were differences to be seen in the flora, and more strikingly in the natives and their houses, which made it evident that we were not in Polynesia but in the contrasted geographical region of Micronesia.

In Agaña headquarters were established in the Officers' Club, where also we resided for a time until, with the departure of the retiring executive, Captain W. W. Gilmer, U. S. N., we removed to the "Palace" as the guests of Governor and Mrs. Wettengel. Almost every day, and sometimes twice a day, field trips were made to one and another part of the island, in quest of the specimens for the American Museum's col-

lections and of the special material in the way of land gasteropods. The weather was very hot during the early weeks, with occasional showers, but later the season changed and the westerly monsoon brought heavy rains almost every day. The region of the Pacific Ocean where Guam is situated seems to be the place where typhoons take their disastrous form before they sweep on westward toward the Philippine Islands and the China Sea. Although the wet weather rendered it impossible to be entirely comfortable during the hours of field work, yet the increased moisture brought the snails from their hiding places, so that many more could be found than on a clear, sunny day. So the time passed profitably and all too quickly as the exploration of Guam was brought toward completion.

Agaña is a town of great antiquity. Even at the time of first discovery there was a village on the plain within the shallow roadstead at this place, and undoubtedly this site was selected on account of the river that rises as a spring in the central hills back of the town, which provides the town with an adequate water supply at all seasons of the year. Agaña extends for more than a mile along the shore, and has several streets paralleling the water front, as well as numerous intersecting roadways at right angles. Nowadays, the streets are well paved with the abundant limestone rock called *cascao*, or *cascajo*, which makes a very satisfactory surface. Good water supply is provided, and electric lights, as well. The general aspect of the town is most pleasing, owing to the cleanliness of the streets and the neatness of the white houses.

As limestone is very plentiful, the better homes as well as the government buildings are made of this material; the walls are thick, so as to make the interiors as cool as possible. Wooden houses are also made, and they, too, are whitewashed as a rule. If the roof consists of tiles or of corrugated iron,



The town of Agaña as viewed from the hills to the south. Agaña is the principal town of Guam and the seat of government



The road through Umatac, which is a characteristic outlying village of Guam



The "Palace" or Government House at Agaña in Guam at the time of the ceremony of installing the new Governor, July 7, 1920



The Cathedral or Church of Dulce Nombre de María, recently rebuilt. This church stands on the site of the original house of worship built in 1669

its slope is gradual, but if thatch is employed as a covering, the pitch is usually steep, so as to make an effective rainshed.

The entire population of Guam is upward of 13,000, and of these almost 9000 live in Agaña. Very few indeed live in the open ranch country, for they prefer to dwell in the main city and in the smaller towns that are situated at intervals on the coasts of the southern half of the island; there are few such villages in the north. Efforts have been made to induce the people to reside on their ranches and little farms, for they lose considerable time during the week in their daily journeys to and fro, in their slow-moving ox-carts, but the age-old custom is strongly fixed, and little success has been attained as a result of such efforts. The rigid custom owes its origin to the fact that the Spaniards in olden times required the people to come back to the settlements at night, not so much for the purpose of mutual protection, but rather for the purpose of maintaining the religious hold of the priestcraft upon the minds and thoughts of the natives. Incidentally, it may be remarked that at the time of Magellan 100,000 natives were said to dwell in Guam; two hundred years later there were 1000!

The Plaza is the center of the official life of Guam. It is a beautiful field about three or four hundred feet square, bordered by cocoanut and royal palms. The old Palace or Government House stands on the south, toward the hills of the interior; it is a masonry building, constructed long ago, and modernized lately so as to be more in keeping with American ideas. The lower or ground floor is occupied by the offices of the Governor and his staff and by some of the government departments, while living quarters take up the whole upper floor. The Marine Barracks adjoin the Palace on the west, and beyond these stands the new school, Dorn Hall. The old prison, the island bank,

and quarters of ranking officers stand on the north, while the Cathedral grounds adjoin the Plaza on the east. East of the church stands an excellent and well-equipped hospital to whose competent staff we were to become eternally grateful for skilful care at critical times during the following weeks.

Although it wears the aspect of great age, the Cathedral as it now stands is not old. It was rebuilt in 1912 because it had been badly damaged by the earthquakes of former years. However, much of the stone work was taken from the former edifice, and the newer parts have been so blended as to preserve the general appearance of antiquity. The name "*Dulce Nombre de María*" is the same as that of the first church which was built in Agaña in 1669, and there are evidences that the present Cathedral stands on the original site, even if the building is not actually the same. The Chamorros are Roman Catholics with few exceptions, and the services on Sundays and Saints' days are fully attended. As the people come out of the doors after their devotions, the Plaza for a time is bright with the varied colors of the women's holiday garments, and the fresh white of the men's clothing.

Then, too, the routine of a naval establishment gives an unusual amount of life to the Plaza. Every morning at eight o'clock, the full band assembles before the Palace, and the halliards of the two flag staffs are manned by marines. Promptly at the first stroke of "eight bells," the band plays the "Star-Spangled Banner," and the national flag and the Union Jack are hauled up, while everyone in sight and hearing stands at attention. All the children of the primary grades have previously assembled in formation on the parade ground itself, and after "colors" they go through calisthenic exercises while the band plays suitable music. On Sunday mornings, the men of Agaña are exercised in military drill, which is compulsory for all the able-bodied

men within certain age limits. While they have a standard or uniform dress, this is worn only on special occasions. Yet dress parade is a truly dignified affair, for the youths maintain that erect and self-reliant carriage which is so characteristic of native races. Occasionally a most interesting drill is witnessed of the "carabao cavalry," as it is called, although the mounts are

obligations to him, as the extended assistance and hospitality offered by his successor, Captain Ivan C. Wettengel, U. S. N., assured the memorable success of our two months' stay in the island. Soon after our arrival, namely on July 7, occurred the formal ceremonies when the transfer of authority was made. On a bright and rainless morning, the officers of the station assembled in the



A drill of the "carabao cavalry" on the Plaza in Agaña

not water buffalo but domestic cattle. All through the day, the bells tell the time as on shipboard, and bugles sound the calls that direct the military life of the station. Again at seven o'clock in the evening, the musicians assemble in the bandstand and play classical and other selections for an hour, while the officers and their families stroll about in the comparative cool of the evening.

Captain W. W. Gilmer, U. S. N., was the governor in office at the time of our arrival, and his courteous aid of our scientific work put us under real

lower verandah of Government House, while the marines in khaki and the bluejackets in white duck were drawn up under the palms of the roadway. Seventeen guns spoke their farewell to Governor Gilmer after his valedictory had been delivered, and the flag had been hauled down for an interval. Governor Wettengel then read his official orders, seventeen guns gave their loud greeting, and the flag was again hauled into place on the staff. The new administration had begun.

Owing to the oceanic isolation of Guam, its animal life is restricted and

peculiar to a marked degree. The earlier explorers reported the presence of two mammals only, both of which are bats and these still exist in the island. The large fruit-eating "flying fox" (*Pteropus*) is not an uncommon sight during the daytime, as it goes about the forest in its quest for bread fruit, guavas, and the edible fruit of a kind of screw pine. The smaller bat is insectivorous, and is like our own common forms in its crepuscular habits. Since early days, several mammalia have been introduced, of which one is a wild animal; this is the Guam deer, of Malayan affinities, which was brought in during the latter part of the eighteenth century by the Spanish governor of the period. The deer are more abundant on the more thinly settled inlands of Saipan and Tinian, but now and again they are killed in the wilder parts of Guam. The inevitable rats and mice have established themselves without any direct human interposition, having landed from vessels that harbored them; in the case of the former, much loss is caused by their attacks on cocoanuts as everywhere else in the Pacific islands.

The carabao or water buffalo holds a high place in the list of domesticated quadrupeds, by virtue of its strength. The animal was introduced from the Philippines long ago, and if it can enjoy a daily wallow in a muddy pool or stream, it thrives very well. Cattle are also employed as draft animals, as well as for dairy purposes. Hogs are highly prized as food, and many have escaped to run wild in the forests where they find a sufficiency of roots and fallen fruit to sustain them. Horses are few, for they do not breed well. Naturally, dogs and cats are abundant, and many of these also have become wild pests.

The birds, like the indigenous mammals, are not frequently met with, although there are many more species of this class. The boobies nest in con-

siderable numbers on the rocks near the entrance of Apra Harbor, and terns occur in some abundance in places. Herons and a kingfisher are the frequenters of the rivers, and a few snipe as well; the kingfisher is remarkable on account of its habit of eating small lizards. The fruit doves of the wooded regions are the most showy in plumage, and their colors are set off to advantage by the green leaves and shadows of the forest.

Lizards are ubiquitous. Along the roads, on logs and tree trunks, quantities of small, blue-tailed skinks sun themselves and lurk for insects. Little tan-brown geckos appear in prodigious numbers in the evening when the lights are lit and insects fly about. At that time the geckos take up their stations on the ceilings and walls of the verandahs, as well as on the white houses near the street lamps. Their pursuits of beetles and small moths are most amusing to watch, as well as their contests for special points of vantage. They are called "Guam canaries" on ac-



Chamorro native riding on a carabao or water buffalo



The large monitor called by the natives iguana or leguan

count of their cheerful, chirping calls; in point of fact, the same kind of lizard is elsewhere called the "Manila canary" and the "Siam canary," so that its distinction in Guam is not peculiar. The natives never molest the geckos, because they consume large numbers of insects, including the all too prevalent mosquitoes.

Of course there is a large lizard called "iguana" or "leguan," although it is not an iguana but a monitor, which often attains a length of more than

four feet. While it is more abundant in the thickly wooded portions of the island, it also lurks about the plantations, where it attacks young chickens, and robs the nests of their eggs. In Saipan it is even more abundant than in Guam, even in the immediate neighborhood of Garapan and the smaller town of Tanapag. Only one small snake a few inches in length exists in the Mariana Islands; it is a *Typhlops*, which lives like the earthworms it resembles, under logs and stones.

Insects of nearly all orders are represented, although the numbers of species are not great. Butterflies are few, excepting those which are naturally to be expected in a region near to Malaysia. Dragon flies are more in evidence. The most annoying insect that we encountered in the bush was a small wasp, whose sting is very painful for a time. On Cabras Island, north of Apra Harbor, these wasps are so numerous as to render collecting a very lively occupation indeed.

Centipedes of small and large kinds are present almost everywhere. On one occasion the author was severely bitten by one of these organisms during the night's sleep in bed, and the severe pain lasted for several hours. One instance of death came to notice, where a native woman had been bitten four times at short intervals; but such fatalities are very rare, and ordinarily the effects of a bite can easily be tolerated.

The life of the shores and the coral reefs constitutes another realm. The reefs are not continuous about the island, and hence the dead shells of mollusks and crustacea are cast up on local areas of the main island. No thorough investigation has yet been made of the varied and interesting fauna of the reefs and shores.

The natives of Guam and of the Mariana Islands in general, are called Chamorros, and they are extremely interesting in history, culture, language,



The Bay of Umatac with its characteristic shores and background of mountains. In Spanish times the Governors lived in Umatac during the hotter season and the ruins of the old residence are still to be seen, overgrown with vegetation



Characteristic "bush" in Guam. Pandanus, or screw pine, and the sago are the dominant plants

and physique. To the newcomer their pallid, light brown color and Malay features are the most marked qualities that distinguish them from the Polynesians. Since the time of their discovery by Magellan they have changed somewhat as a result of the alien influences of many kinds that have affected their lives; nevertheless their race constitutes a distinct group, whose affinities with other Pacific peoples are capable of specification with some certainty.

The early navigators and missionaries have left very satisfactory and unusually consistent accounts of the people and their lives during the centuries that followed Magellan's discovery. The student of the Mariana Islands, and indeed of the Pacific Ocean in general, is fortunate in having available an extensive volume by Lieutenant William E. Safford, U. S. N., retired, an officer for some time on the staff of the Smithsonian Institution. This work is entitled *The Useful Plants of Guam*, but in addition to its exhaustive botanical sections, it comprises a full account "of the physical features of the island, of the character and history of its people, and of their agriculture." Lieutenant Safford has also written extensively on the language of the Chamorros; needless to state, his works have afforded indispensable guidance to the studies of the present writer.

In early days, the Chamorros were tall and well formed, robust, and unusually free from disease, living to an age often exceeding a century. They were expert boatmen and swimmers, but time has led them to live their lives more and more upon the land, so that very few now engage in fishing and life upon the sea. In origin, the Chamorros unquestionably came from a fundamental Malay stock, but their isolation in their chosen island homes was followed by distinctive evolutionary changes. They used the betel nut for chewing with lime and pepper-leaf, as the Malays

do today, and they grew rice. These two customs are most significant in connection with the question of origins. Furthermore, they did not use "kava" as a beverage or the paper mulberry for the manufacture of "tapa" bark cloth, as did the peoples of the eastern Pacific Islands. Nevertheless, the Chamorro language displays many likenesses with Polynesian dialects in structure and in the astonishing number of similar words for the commoner objects of everyday experience. There are also Melanesian elements in their culture, as well as Polynesian components. The best summary statement with regard to Chamorro origins is the following paragraph from Safford's work:

"From a consideration of these features in the language, customs, and arts of the aboriginal inhabitants of Guam it is evident that they did not accompany the settlers of Polynesia in their exodus from the region of their common origin, but that they remained united or in communication with the ancestors of the inhabitants of the Philippines, Madagascar, Malaysia, and certain districts of Cambodia until after the evolution of the grammatical features which are common to their languages and the introduction of rice as a food staple. And it is probable that they did not leave the cradle of the race until after the adoption of the habit of betel chewing, which was introduced from India long after the departure eastward of the settlers of eastern Polynesia, who took with them yams, taro, sugar cane, and cocoanuts from their former home."

Today there are no pure-blooded Chamorros because so much mixture with other races has taken place. The Spaniards themselves infused a new element into the racial complex, while Filipinos were brought to Guam in considerable numbers as workers and as prisoners, and their intermarriages have had even greater effects. One of the results has been a marked decrease in the average height of the people, which is now scarcely greater than in the



A family of Chamorro natives at Umatac. The man is the teacher in charge of the local school

Filipinos proper. Despite the adoption of many words from other languages, the old language still lives, because the Chamorro mother passed it down to her children.

The people are occupied largely with agricultural pursuits, in which nearly all are engaged, for they have only a slight degree of economic division of labor, and virtually everyone is a "jack of all trades." The care of their farms and of their domesticated animals engrosses them completely during the week. They grow rice, maize, sweet potatoes, and the like, each family for itself. The only real industry with an export value is the making of copra from cocoanuts.

The smaller villages distant from the capital are lesser counterparts of Agaña, but more primitive in the nature of the

case. They comprise fewer stone houses, of course, but there is always a stone church and usually one or two places belonging to the leading men are built of the more durable materials. Every town has its schoolhouse and teacher; and even in the smallest places the work of education is carried on. Lately a spirit of rivalry has been developed through the institution of district fairs, when the people exhibit their prize livestock and farm products as well as the best examples of their handiwork in the way of basketry and embroidery. The effect has been most stimulating, and has led to awakened interest in affairs that were formerly regarded as matters of drudgery and routine.

Much might be written about the botanical characteristics of Guam and its associated islands, with which the

field naturalist becomes closely acquainted during the days of study and collection. The flora is what is called the "strand association" because it includes so many elements like "*Barringtonia*" and the many kinds of *Pandanus* that are characteristic of island shores. The northern half of Guam, above the transverse zone of farming country, is covered almost completely by a dense bush, which does not grow very high as there are few of the more lofty kinds of trees. The mountainous territory is relatively bare, save in the upper regions of a few of the southern and western heights. The southeastern areas are covered with "cogon" grasses, excepting where the darker green bush grows along the borders of the main streams and their tributaries, marking the water courses with great distinctness.

The journey to Saipan was made during the last week of July, 1920, and yielded some of the most interesting experiences of the whole expedition. My son and I had looked forward to this trip with much keenness, partly because the collections from another island of the group would be particularly valuable in comparison with the material from Guam, and partly because we knew that in Saipan there was a colony of natives from the Caroline Islands, with distinctly different physical characteristics. It was necessary first to cable to the Foreign Office at Tokio, requesting official sanction for our prospective visit, for Japan now controls all of the Mariana Islands, with the sole exception of Guam. Before the Great War, these islands belonged to Germany, to whom they were sold by Spain, with the acquiescence of the United States, after the Spanish War and the capture of Guam by our vessels. A prompt reply from Tokio gave us the desired permission to visit Saipan, as well as the intervening islands of Tinian and Rota, but as it transpired, we were able to land only at the first named

place. There are no vessels plying between Guam and the Japanese islands; the latter are reached only from Yokohama by the trading steamers that touch at Saipan and then proceed to some of the places in the Caroline Group, such as Yap, Truk, and Ponape. But Governor Wettengel added to the many favors he had already conferred, by arranging for our transportation by the "Bittern," a small naval vessel stationed at Guam. Accordingly we embarked late one evening, and steamed out of Apra Harbor at midnight under the clear light of the tropic moon.

With the dawn we were passing Tinian, which is much like the northern half of Guam in its characters; for the most part it is composed of elevated reef limestone, and it is thickly covered with cogon grass and low bush. Saipan appeared more rugged in character as the distance lessened, and its broken mountain ridges, trending north and south, rose high above the flat coastal plains of disintegrated limestone and soil. Only the lower ground, devoid of the thick forests of the heights, is suitable for the many small plantations of the natives and the larger enterprises of the newly established Japanese companies. The general aspect of the lower country, seen from a distance, was most abnormal in so far as the cocoanut trees were sadly affected by the scale insects introduced from the Carolines; fully 80 per cent. of the trees were destroyed, and either hung their dejected clusters of brown fronds from the top of the curving trunk, or were entirely devoid of leaves. Our destination was the town of Garapan, situated on the western side of the island, and this soon came distinctly into view at a point about midway between the northern and southern points of land.

The "Bittern" came to anchor off the reef which grows far out from the shore, and a launch was put over the side to convey us to land. The sea was rough and dangerous, but the opening in the



The old church and the new Japanese headquarters at Garapan, in the island of Saipan

reef was found and passed without mishap; we glided over the quieter waters of the lagoon with a sharp lookout for submerged coral masses, and neared the little "summer house" on a wharf that seemed to be the proper landing place. Long before we stepped on shore, all the natives of the town who were at home and not at work on their distant farms, thronged to the jetty to await our coming—Japanese in their characteristic robes, Chamorros in singlet and trousers, and the brown Caroline Islanders with far less in the way of clothing. They manifested considerable excitement, for the event was of a most unusual order; an American vessel from the South was about as unaccountable as an *aëroplane*. We were met by three or four Japanese officials in formal uniforms that had hastily been donned as our intention to land became evident, and to these officials our various credentials were presented.

In spite of the fact that some of the Japanese could converse in English, the situation was rather strained, and it would have been difficult indeed to explain our visit and its purposes without assistance. By the greatest

good fortune, there was present a young Spanish Chamorro named Gregorio Sablan, who was entirely proficient in English and Japanese, and, as I learned later, in six or seven other languages as well. I had hoped he was at Garapan, and had brought letters to him from relatives in Guam, where he had been born and had formerly resided. Sablan was not only a teacher and missionary, but he was also the official interpreter on all occasions. It was through his capable services that we came to an understanding with the officers who met us at the shore. And he remained with us when our little party climbed the hill above the old stone mission church, built long ago by the Spaniards, to present our respects and to explain our presence to the Governor, Lieutenant Commander Yamamoto, of the Imperial Japanese Navy, who awaited us at headquarters in a modern building of wood, above which floated the white flag with its red sphere as the symbol of Japanese authority. Over the warm lemonade and cigars, cordial relations were soon established, while we discussed the scientific work which was our special object. The "Bittern" returned



Natives of the Caroline Islands, now residing in Saipan, dressed in gala costume. These are the chief dancers of the settlement



An informal group of Caroline Island natives

to Guam until it should call for us a few days later at a time that had been agreed upon.

Señor Sablan virtually adopted us, very much to our satisfaction. After consulting with various officials he arranged for our occupation of a suite of rooms belonging to the absent Civil Governor, in a well built stone house on a back street of the town. Sablan also conducted the necessary negotiations with a Japanese restaurateur for our meals, which were duly brought by Japanese maids wearing clattering *gitas*, or sandals raised on little blocks of wood. He accompanied us at all times in our excursions about the island, and he manifested as much interest in our pursuits as we ourselves would show in the place and its people. In effect, he made our stay in Saipan a real success.

Garapan is the home of less than 3000 people. There are a few score Japanese officers and traders, while the bulk of the population is composed of Chamorros and Caroline Islanders in approximately equal numbers. The town extends along the shores for a mile or so, and its houses are built on two or three straight and wide roadways paralleling the strand. Stone buildings are few, and for the most part the dwellings are made of wood or bamboo, with thatched roofs, as in the remoter towns of Guam. The two main components of the population dwell in separate halves of the town, the Chamorros to the north and the Caroline Islanders to the south. Their relations are entirely amicable, but practically no intermixture of the two races has taken place through intermarriage. Each perpetuates the culture of its ancestors without modification.

The Caroline Islanders were of the greatest interest to us. Our temporary home stood in their part of Garapan, and they were about our doors and windows at all times. We were the only Caucasians on the island, and as

such were objects of much curiosity, especially in the case of my son, Henry, who was the only white youth many of them had seen. Whenever we strolled about the town, there was invariably a following group of youngsters in our train, observing every detail of our dress and speech and action. The women of this race ordinarily wear a single strip of cloth about the body below the waist, or the more characteristic mat of woven banana or hibiscus fiber, dyed in pleasing patterns and colors. The men wear a simple loin cloth, while the children run about naked until the age of ten or twelve. The gala costume comprises highly colored mats, bead necklaces of various forms, and ornaments of tortoise shell, while bright flowers are worn as garlands and decorations in the hair. This whole community has been constituted by emigrants from Yap, Uleai, and the Mortlocks, and several other islands to the south, who first came to work on plantations owned by foreigners. Formerly there were a few in Guam, but after the Spanish war they joined their fellows in Saipan. They are colloquially called "Kanakas," but this term refers properly to the true Polynesians. In many respects the Caroline Islanders do resemble the Polynesians, and their likenesses are all the more emphasized by their real differences from the Chamorros, who, as we have noted, are more like the natives of the Philippines and Malaysia.

Despite the heavy rains and oppressive heat, our work progressed favorably. Early in the morning, Señor Sablan would appear with one or two heavy native carts drawn by cattle. Soon we would be joined by a Japanese officer named Mr. Kowno, who had been assigned by the Governor to accompany and aid us in our travels. The creaking carts jolted over the worn and uneven roads in such a way as to rack our bones and bruise our muscles, so that we were glad now and then to

walk for a little distance or to dash into the brush after a novel species of butterfly or dragon fly. On occasions we were the noontime guests of Japanese planters, in houses that seemed to have been transported entire and complete from Tokio, and where our hosts in flowing garments tendered the polite hospitality of their race. At other times, the journey to a forested height would be made necessarily on foot, across the farm lands of the natives and through the thick brush, where we found the desired land snails in satisfactory abundance. In all, about four thousand specimens were brought back from Saipan.

The evenings were fully occupied with the care of the collections, the writing of notes, or the quest for night-flying insects. On one occasion, Governor Yamamoto tendered us a formal banquet at which we met most pleasantly

some of the prominent officers and citizens of Saipan. Not the least memorable was an evening *en famille* with Señor Sablan and his relatives, when after dining we talked over many things of mutual interest, and the nephews and nieces sang songs in English and Chamorro which their gifted uncle had taught them.

During the last two or three days, the rains were virtually incessant, and the winds were blowing strongly from the storm-breeding quarter of the west. It was with some concern that we looked forward to the day when the "Bittern" was to return for us. A real typhoon did indeed develop, but fortunately its center passed to the eastward so that we escaped its greatest severity. Nevertheless, the sea was very high when finally the expected vessel arrived off the reef, and we put off on the tossing waves to be received again on board.



On the road in Saipan. The carts are strongly built to stand the jolting on the uneven roads. The natives on the left are Caroline Islanders residing in Garapan

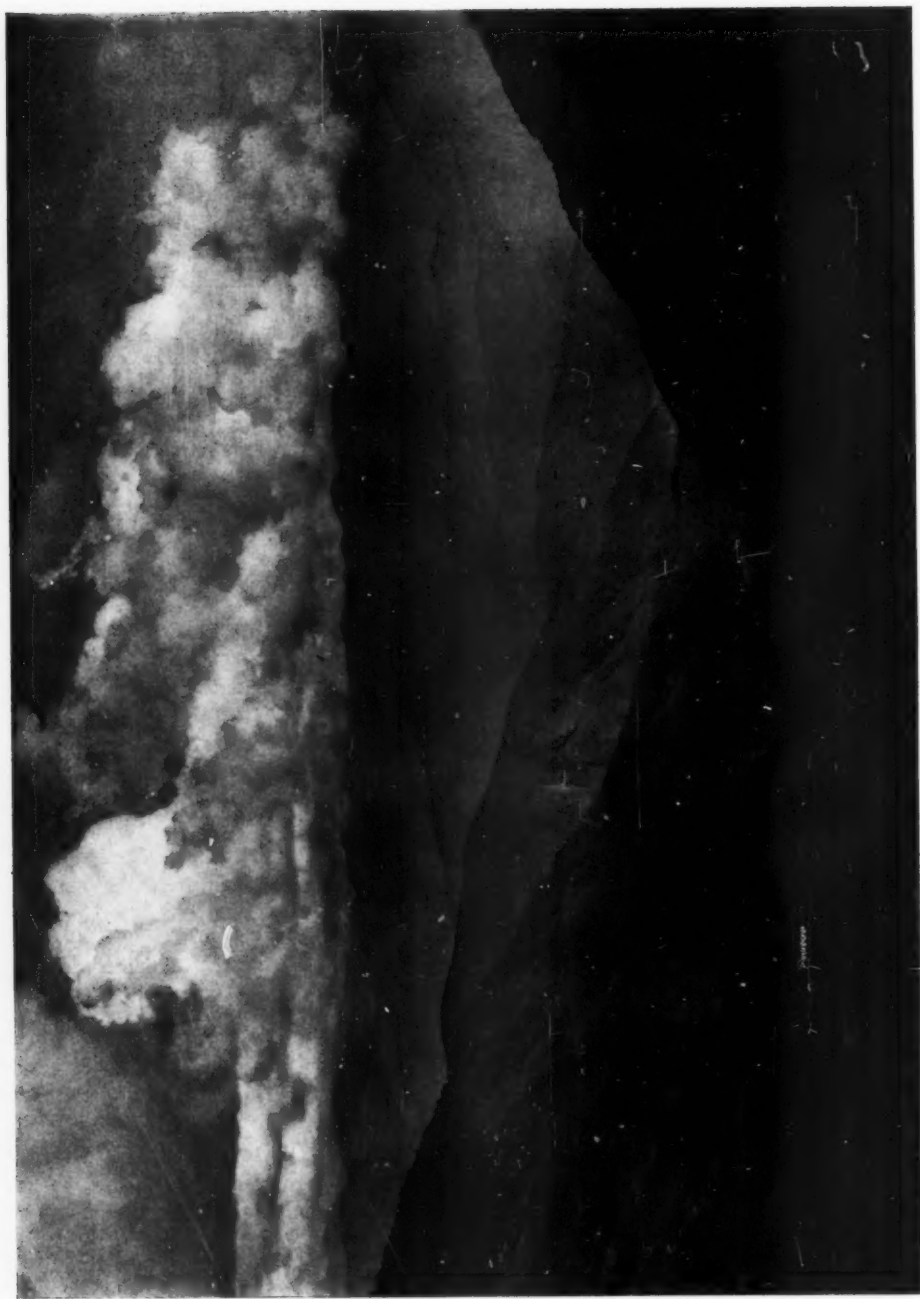
The eventful trip to Saipan was ended when on the following morning we reached Apra Harbor at Guam.

At last the day arrived when the transport came that bore us to Manila. The two months in the Mariana Islands, so crowded with interesting experience and observation, were over, and the collections were packed and ready for

shipment to New York. It was hard indeed to say farewell to our new-won friends, whose many kindnesses had made our sojourn so profitable and enjoyable. As the island faded in the receding distance, the hope grew ever more definite that fate would be so kind as to take us again to the delightful island of Guam.



The author's son, Henry E. Crampton, Jr., and our Japanese companion, Mr. Kowno. The photograph was taken in Saipan at a splendid collecting ground for *Partula*, and it shows a number of the animals on a leaf of the elephant's-ear, or *Caladium*.



VALLEY OF THE RIO ZAMORA, ECUADOR

Looking down into the heart of the "Oriente." Jungle of the densest character covers all of these slopes

THE JIVARO INDIANS OF EASTERN ECUADOR¹

BY

H. E. ANTHONY *

IN southern Ecuador the Andes form a broad strip, running north and south, made up of numerous short ranges which extend in all directions and make it exceedingly difficult for the traveler to discern any definite system of main mountain ranges. When the easternmost edge of this strip is reached, however, a lofty barrier of high, wind-swept peaks marks the beginning of Amazonian drainage, and the region eastward from their Atlantic-facing slopes is known as the "Oriente." It is in the "Oriente" that the tribe of the Jivaros make their home.

Accompanied by Mr. George K. Cherrie, the veteran of many a South American expedition, I spent about a month in the "Oriente" and during that time saw a little of these Indians and was told a great deal concerning their customs by the few scattered families of whites who live on the edges of the Jivaro territory.

The Jivaros are a tribe of warriors and hunters, and devote but little attention to the cultivation of the soil. They live in small, scattered communities located on the rivers, and raise a little cotton and such things as yuca or cassava. Although they recognize a captain or chief, his authority appears to be largely nominal. He exerts but little influence upon the members of the tribe. As a result the communities are controlled by the heads of the families and the system may, perhaps, be best described as patriarchal. The father of a family is a responsible member of the community and his relatives aid him in offensive campaigns or rally to his defense.

The Jivaro looks down upon the white man, who has only one wife, because among the Indians the measure of a man's valor is the number of his wives.

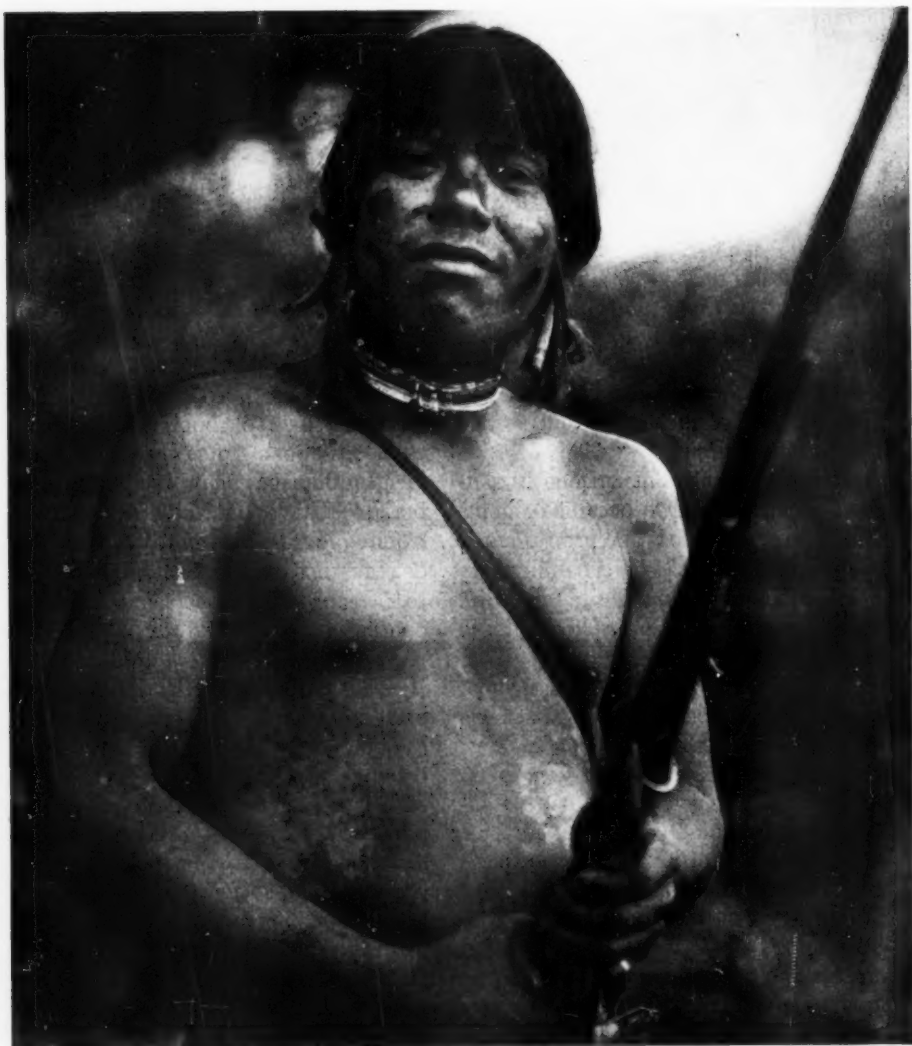
Polygamy is regularly practised and a man may have four or five wives or even as many as eight. This custom is the cause of the greater part of the fighting and killing that takes place in the Jivaro territory.

When a daughter reaches the marriageable age, twelve to fourteen years, she is given to a man who is friendly to the father. There is no price set on the girl and the transaction involves merely the good will of the two men. The girl herself is not consulted. This method of gaining a wife is, however, rather a slow process for the ambitious Jivaro who is striving to acquire a large household in a region where women are at a premium and every girl of marriageable age is much sought for. A more efficacious method, provided all goes well, is to wage war upon some neighbor or against a family of an adjacent tribe and to confiscate, as the spoils of victory, the widows of such a man. By a carefully planned stroke of this kind the Jivaro may gain several wives at once.

The Jivaros do not believe in a benign deity, but in a power which is spoken of by the Spaniards as *el diablo*, the devil. This being is not necessarily malicious in his attributes, but rather is considered to be a "Super-Jivaro," one powerful in all matters, omnipotent for good or evil, but not loving evil for its own sake. When an important project is under consideration—a foray for wives or a long hunting trip into the territory of a hostile neighbor—the Jivaro deems it of the utmost importance that the "devil" be consulted. For this purpose he retires to some secluded spot, let us say a small hill off in the jungle, and there drinks a quantity of a certain vegetable extract. This extract, made from the bark of a root, is a dark fluid

¹Article and illustrations copyrighted by H. E. Anthony, 1921.

*Associate Curator of Mammals of the Western Hemisphere and Leader of the American Museum's Expedition to Ecuador, 1920-21.



A burly Jivaro who was a frequent and interested visitor at our skinning table

resembling coffee. It produces a narcotic effect upon the human system and the Jivaro passes into a stupor of several hours' duration, during which he experiences various weird hallucinations. One of these hallucinations is that the devil comes to him and gives advice regarding the proposed plan. If favorable views upon the matter are entertained by the devil, the project will be attempted. Consultation with the devil may be had by any man, for it is not the

special province of any priestly class. I have spoken with white men who have sampled this narcotic drink and from the reports of its effects I judge the active principle of it must be some powerful alkaloid.

Perhaps some neighbor in the same tribe has been selected as a victim and the Jivaro plans to kill him with as little personal risk as possible. These Indians are adept in the use of the long blowgun, employing poisoned arrows, but prefer



"Tserie," a young man of the Jivaro tribe. I was told that "Tserie" is the name these people give to the small marmoset monkey

to do the man-hunting with guns which they obtain from traders. The approved method, when the raiding party consists of two or more individuals, is to surround the hut of the designated victim, and wait for the man to come out through the doorway. As he steps forth, he receives the contents of several muzzle-loading muskets at close range. Then the place is raided and all the women and children are taken prisoners. The women enter the household of the victor as wives, while the children are

adopted and given the same treatment as the man's own offspring. That is to say, the captives are not considered to be slaves, but henceforth are a part of the victor's immediate personal family.

The Jivaro has his own peculiar method of celebrating the successful *coup* against an enemy and in many respects this custom might be compared with that of the North American Indians in taking scalps. The Jivaro cuts off the head of his enemy and, when he has returned to the safety of his own hearth,

converts it into a lasting trophy by removing the skull and shrinking down the skin into a miniature head about the size of a man's fist. The process whereby the head is prepared is described in a separate article in this issue by Mr. Charles W. Mead. As a culmination this trophy is used in a ceremonial dance, which generally occurs within a month of the time when the head was taken. The event is in some respects the counterpart of certain scalp dances. The victorious Jivaro dances with his trophy to celebrate his bravery in overcoming an enemy. His friends attend the ceremony and drink quantities of an intoxicating liquor, making much of the occasion. Until this ceremony is consummated, the Jivaro cannot be persuaded to part with the head, but afterward he will trade it for a sufficient inducement, such as a rifle, or in the absence of such a consideration he may hang it up in the hut. The possession of several heads fixes the standing of the owner, although the acquisition of each new head makes the retention of his own the more uncertain, for the relatives of the slain man will assuredly attempt vengeance.

Thus it is that there exists constant warfare in the land of the Jivaro, where the two powerful, primal passions prevail, struggle for woman and thirst for vengeance.

The lot of the Jivaro woman is not a happy one as she is destined to do the greater part of the work and is the storm center for most of the strife. On the other hand, the men impressed me as being good-natured toward the women and spoke kindly to them. I believe, therefore, that in all minor matters the women receive some consideration.

Sternest discipline, however, awaits any woman, who is found to be unfaithful to her husband. Even for the first offense an extremely cruel punishment is inflicted. The erring woman is thrown to the ground and held there while her husband, using the long, heavy machete

or brush knife, cuts down on her head as hard as he dares to do without actually killing her. He cuts a number of times in one direction and then again at right angles, so that when the woman is released her hair is all chopped to bits and she is streaming blood.

If this treatment does not deter her from a second manifestation of infidelity, an even more rigorous punishment awaits her. She is pinned to the earth by the large lance or spear used by the men, the spear being thrust through the fleshy parts of the legs and then deep into the ground. She is kept thus for several days or even as long as three weeks, being given food and water and sufficient attention to preserve life. The punishment for the third offense is death outright.

The men are hunters of the highest order, and are keen observers of all that takes place in the jungle about them. They penetrate the thickest tangle, using game trails wherever they find them; the bear makes many a highway for these hunters. They never get lost and their highly developed sense of direction enables them to point back at any time toward a given place, such as the camp they left in the morning. This ability is known to those whites who occasionally penetrate into "Jivaría." Sometimes a white man, wishing to test their powers, will ask them at different times to point out the direction to camp or to a certain river, thereby earning the supreme contempt of the Jivaro, who thinks that any fool should know such simple matters.

The Jivaros have a specific name for practically every bird and mammal to be seen about them and, when our skinning table was piled up with specimens for the day's work, one of them would unhesitatingly name each animal. If a test was made on a later date with a bird or mammal of the same species, the designation previously used was invariably applied, proving that these names were not made up on the spot.



A VISITING JIVARO

Decked in all of his best finery of feathers and beads and spotted with bright paint, this Jivaro dandy, who visited our camp, presented a picturesque appearance



The "kinkajou" or "honey-bear" of the Jivaros has no immediate relatives north of Mexico. Its thick fur is a soft golden-brown

On one occasion, Mr. Cherrie had shot an olive-backed thrush, a sober-colored species that nests in North America and migrates southward in the winter, and consequently not one of the birds strictly belonging to the region. A Jivaro who was going over the birds and naming them, promptly singled out the thrush and said in substance: "This bird is a foreigner. He visits us only in the winter and does not nest here." An instance of this sort implies the keenest sort of observation, because the Jivaro must meet with from two to three hundred distinct varieties of birds, most of the smaller species of which have at best little value to him as food and consequently are of but minor importance. The birds of brighter color are often killed so that they may be attached as ornaments to the ceremonial necklaces, headbands, etc. that are worn in the dances.

A great part of their game the Jivaros kill with the blowpipe or blowgun. The blowpipe is a long, slender rod of wood, made from two strips which are carefully

hollowed out down the midline, in such fashion that when bound together by a long strip of bark there is a straight, smooth, cylindrical bore the full length of the rod. The blowpipe is generally made of black palm, which has a very tough, interlacing fiber, so that the rod, though slender, has great strength and will not warp or twist. The ammunition for this weapon may be either little balls of clay or arrows. Clay is shaped into small balls, of a diameter just big enough to fit the bore. These balls, after having been baked in the sun, are placed in the mouth and blown through the tube as a small boy blows a bean in a toy blowpipe, but the length of the Indian blowpipe, often eight to ten or more feet, gives the clay ball a great velocity. As a result the projectile will kill small birds or mammals such as squirrels or rabbits. The arrows are long, slender strips of cane, straight and with a sharpened point; a tuft of cotton is twisted about the rear end of the arrow to make it fit the bore in an airtight manner. These arrows fly exceedingly true and game may be struck with them at long distances. For larger game poison is used; for small birds the arrow is plain.

For this purpose the Jivaros use a black, gumlike substance brought up from the lower Amazon and undoubtedly a form of *curare*. The arrows are prepared by dipping into the poison about half an inch of the tip which then looks very much as if it had been coated with tar. This poison is narcotic in its action and very deadly and an animal that has been wounded with an envenomed arrow will drop in a very few minutes. If the Indian is hunting monkeys, his favorite game, the arrow is scored with a knife about an inch back of the point so that it may break readily at this place. The monkey shows considerable cleverness when hunted and, if wounded, invariably plucks out or breaks off the arrow. He is outwitted, however, by this precaution, because the



Demonstrating the use of the blowpipe.—This Jivaro had killed an enemy but a short time previously and was still on the vegetable diet, which, in accordance with the tribal custom, is prescribed at such times

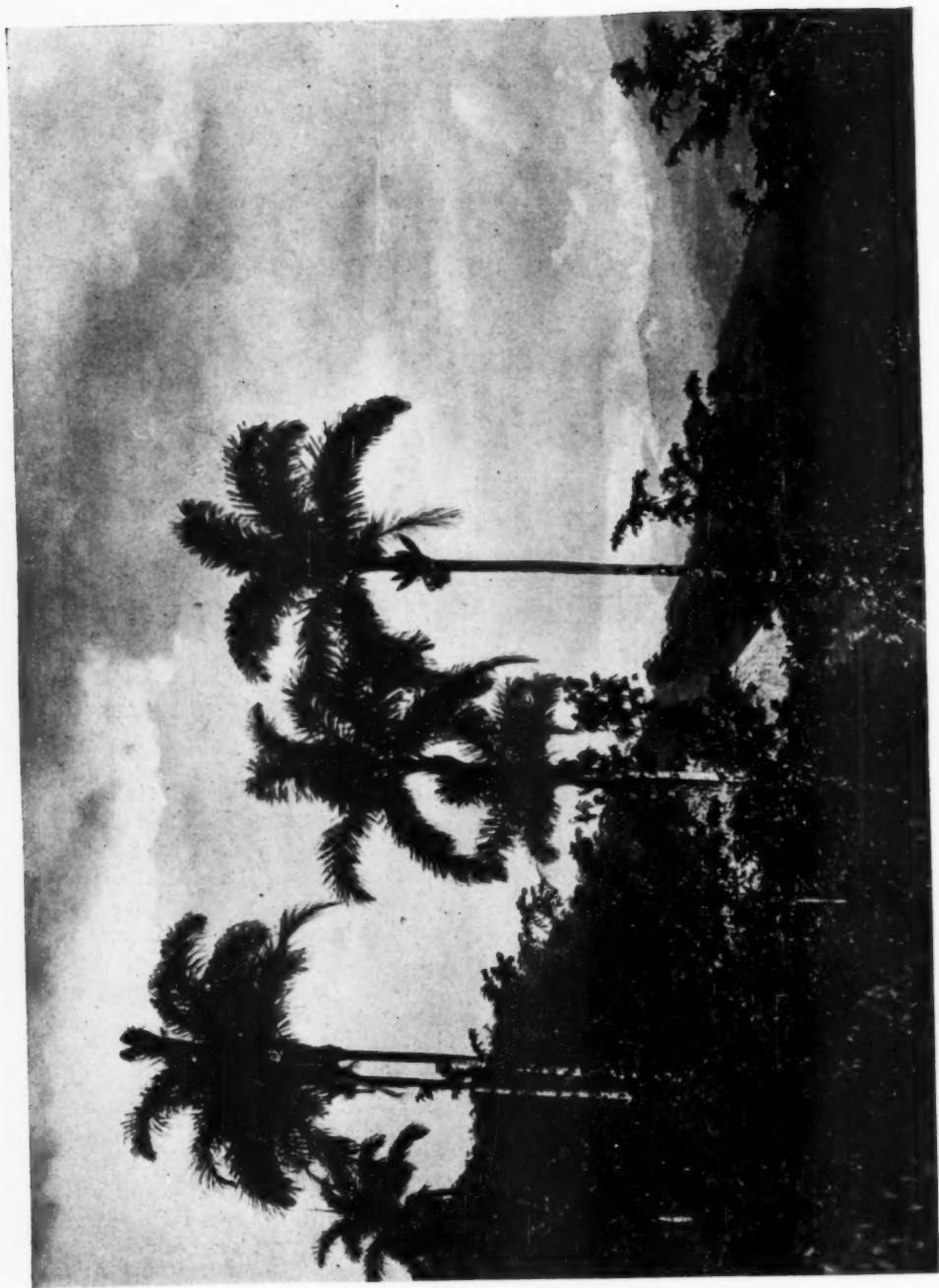
arrow breaks and leaves the poisoned tip in the wound. I was told that salt is an antidote for the poison, and if the Jivaro wishes to take a monkey alive, he may do so by hurrying at once to a stricken animal and placing salt in its mouth.

Another weapon frequently seen among these people is the lance or spear. The point of the lance is of iron, very sharp and flat; the shaft is of some tough wood. With this they may kill bear, peccary, or any of the larger terrestrial mammals.

The Jivaro lives along the water courses and does considerable fishing in a very ingenious fashion. A variety of creeper or vine, called *barbasco*, is gathered at some point along a stream, and then the plants are pounded into a pulp upon the rocks. When sufficient *barbasco* has been prepared—the quantity may total from two to three hundred

pounds—and the Indians have stationed themselves down stream, the mass is thrown into the river. The juice of the bruised vine is a poison and, if the river is not flowing a great volume of water, it kills any fish in its path for a distance as great as three miles down stream. The Jivaros catch the fish as they come floating along belly up and in this way secure great hauls. The use of *barbasco* does not spoil the fish for human consumption, as we can attest through personal experience. One disadvantage in its use is the heavy drain upon the fish life of that particular region, and a stream cannot be fished in this manner indefinitely. Even a large river may be poisoned by this comparatively small amount of *barbasco*.

The Jivaro will eat most of the animals of the forest, but there are one or two surprising exceptions. For some



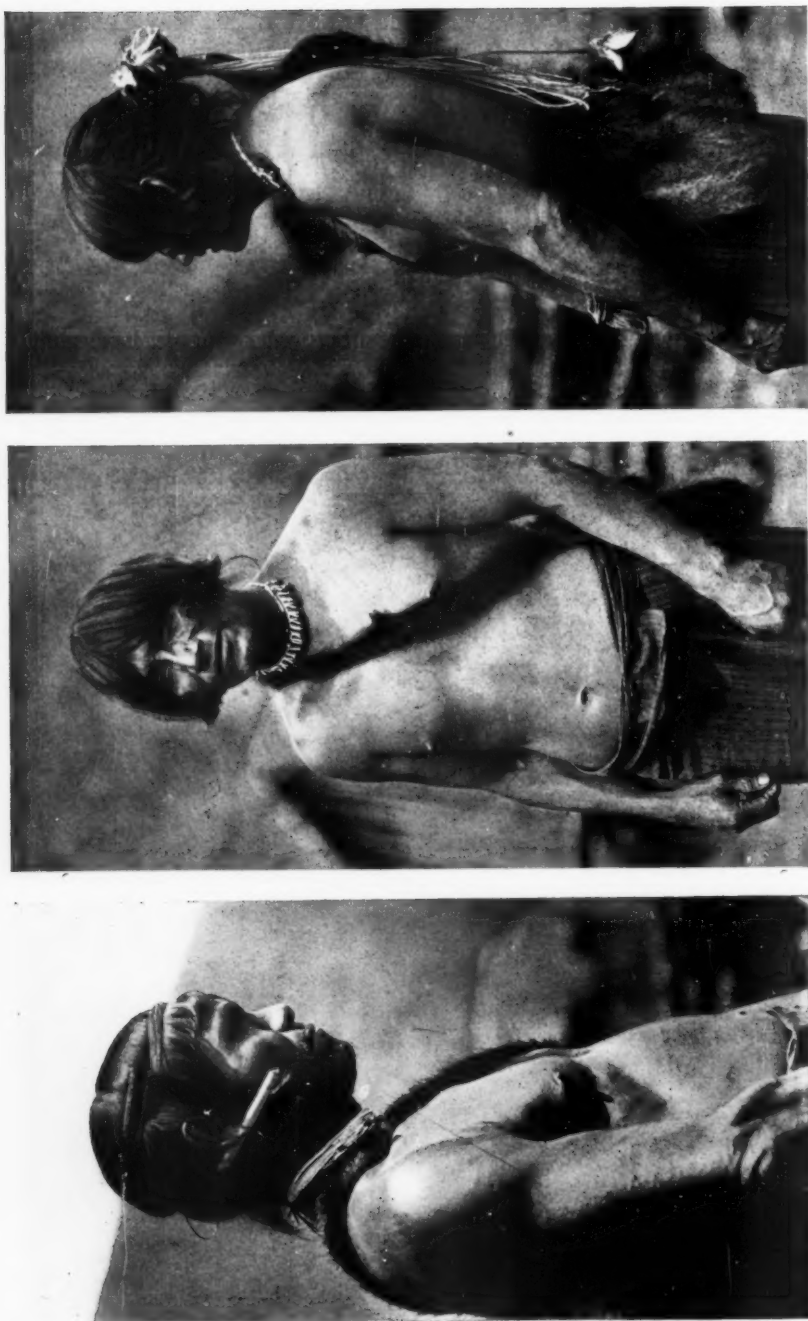
A FIRST GLIMPSE OF ZAMORA

Palms are a conspicuous feature of the landscape in Jivaria and are frequently found in great groves



A NEARER VIEW OF ZAMORA

This historic little settlement lies in a narrow valley where the beautifully clear Bombascaro flows down to meet the turbulent Rio Zamora



TWO CONTRASTED TYPES OF JIVAROS

Distinct methods of headdress and individual facial characteristics are here indicated. The figure in the center and the one on the right are different pictures of the same Indian. Fastened into the hair of this man are strands of coarse cotton cord of native manufacture, similar to those which are attached to the lips of the shrunken heads shown on p. 160



WOMEN OF THE JIVARO TRIBE

The girl, although only about fourteen years old, is married. She was very shy and difficult to photograph. The older women showed no fear of the camera and posed readily. Note the small piece of cane in the lower lip of the girl

unknown reason he will not touch the flesh of the deer although he has no scruples against killing it for a white man to eat.

A very peculiar custom we observed is the diet chosen by one who has recently killed an enemy. Such a man avoids meat, confining himself to a vegetable diet. The reason given us was that if he consumed meat, he would be easily surprised and killed by the friends of the man he had slain, whereas if he ate vegetables he would be hard to surprise.

These people have a very wholesome respect for the snakes of their jungles and with good reason, for there are several venomous varieties among them. It is said they have an antidote for snake bite, using some plant which counteracts the venom. Because they go about barefooted, they are often bitten but, thanks to this plant, seldom killed by a snake. Among the material collected during a day's work I had a small coral snake (genus *Micrurus*) which was alive although somewhat incapacitated through rough handling in capture. At the time I judged it to be a non-venomous species, but nevertheless retained enough caution to handle it by the back of the neck so it could not strike me. A Jivaro who was standing over our table, very much interested in everything that was transpiring, displayed some apprehension when I showed him the snake coiled up in a small can, and beat a very hasty retreat when I took it out in my hand, acting in much the same manner as might a timid girl in the presence of a mouse.

The Jivaros have the reputation of being rather cowardly. As far as open warfare is concerned, the experience of the whites who have lived among them has been that the Indian will not dare to attack the white man under any conditions that approximate equal combat. As an instance, I was told of a Spaniard who lived among the Jivaros for a number of years in a rather remote locality where he was far separated from any other whites. He early incurred

the enmity of the Indians and, as he was harsh in his dealings with them, it was not long before he was a marked man. On several occasions parties of the Jivaros attempted a raid against him, having first consulted their "devil" as to the propitiousness of the opportunity, but it would seem that the Spaniard as well must have been on intimate terms with the devil for he learned each time of the projected attack and killed so many of the Jivaros that the parties fled. By means of this bold front he was able to more than hold his own with them for a great many years, but eventually he so far relaxed as to hand over his gun to one of his Jivaros to carry while he went on ahead, and the Jivaro promptly made the most of the unexpected opportunity.

In general their behavior toward the whites who treat them properly leads to rather amicable relations. With us they were very friendly and very good-natured, answering any questions as well as their poor Spanish allowed. Only a few of them speak Spanish, but they are intelligent and quick to grasp an idea so that a few words in Spanish aided by signs, may convey much. No one of those we met knew much Spanish, and a peculiarity I noted was the fact that almost always the verbs were used in the participial form. This gave to their conversation a sound very like that produced by riming verse. As an example, I heard this sentence:

"En camino pasando, animales encontrando, un mono matando, cuero sacando, billetes ganando," which would be translated as: "He goes along the trail, meets animals, kills a monkey, skins it, and gets some money."

The Jivaros were very much interested in our work, which appealed to them because it dealt with the most vital feature of their daily lives, the animals of their own jungles.

They are a rather difficult people with whom to deal, for the reason that money has scarcely any value in "Jivaría" and

their material wants are few. It is possible to gain their friendliness by gifts of such a nature as mirrors, needles, fishhooks, or powder and shot; but if one desires to secure the labor of a Jivaro, as a canoe man for example, it may be necessary to do a great deal of patient and tactful trading before you succeed in engaging him.

The Jivaro hut is a simple affair, made of a long, rectangular frame of poles stuck into the ground and thatched over

with the leaves of palms or plantains. The fire is built inside on the ground and the smoke finds its way out through the most convenient openings. As evidence of their handiwork, I saw very creditable cotton cloth, which had been made by them from their own cotton. Strangely enough, the men, when questioned, said that they personally had woven this, the household weaving of fabrics being peculiarly a feminine province everywhere else in Ecuador.



THE RIO DESTROZO

One of the countless, crystal-clear, streams that plunge down the slopes of the "Oriente." It owes its significant name of Destroyer to the fact that its descent to the Zamora is accomplished in a series of precipitous leaps, the water tearing away everything in its path except the largest boulders



WAR TROPHIES OF THE JIVARO INDIANS OF ECUADOR

These human heads, which have been subjected to a shrinking process after the removal of the bones, are a ghastly tribute to the cunning rather than the prowess of the Indian who has acquired them. To the notion of the white man this method of warfare, which is pursued partly for the acquisition of heads but also and to an even greater extent for the purpose of gaining wives—the victim's family being incorporated in that of the conqueror—is but stealthy assassination

SHRUNKEN HUMAN HEADS AND HOW THEY ARE MADE

BY

CHARLES W. MEAD*

THE diminutive shrunken heads made by the Jivaro Indians, suggesting, save for their long, straight hair, the heads of Negro pygmies, have been familiar objects in museums for many years and many have been the queries as to how and why they are made. Just how they are made is a problem that has only recently been solved, though many, and oftentimes absurd, have been the speculations as to the way the Indians managed to shrink them to so small a size. One that for some time obtained widespread credence was, that in an early stage of the work the skin of the head was boiled. Of course, boiling would have caused it to fall to pieces. The heads are always black in color, and this was accounted for by the supposition that they had been smoked over a fire.

The details of the process did not come to us all at one time, but by dribblets from different travelers who had visited some part of the Jivaro country in eastern Ecuador. Indians guard such tribal secrets very jealously, and it is extremely difficult, and in most cases impossible, for one who remains but a short time in their country to obtain exact information about them. The method is as follows:

The head, with a small part of the neck, is severed from the body. A cut is made from the base of the skull down through the skin of the neck. Through the opening thus made the bones of the head are carefully removed, and the skin and remaining soft parts are dipped into the juice of the *huilo* fruit, which stains them black.

The skin is now ready for the shrinking process, which varies somewhat in different localities. In some divisions of

the Jivaro tribe a number of hot stones are put into the cavity, and the whole is constantly turned in order to bring them in contact with all parts of the inner surface. When one Indian tires, the head is passed to another. It is said that the process sometimes continues for a week or more before the head is reduced to the desired size.

In other localities a single stone, nearly the size of the head, is first used, then a smaller one, and so on until the work is completed. In still other localities hot sand takes the place of stones. Long, pendent cords usually fasten the lips together, and one is run through the top of the head to suspend it. The cut in the back of the neck is then sewed up, and the trophy is finished.

The first heads that found their way out of the Jivaro country did so by being passed from hand to hand until they came into the possession of some trader who brought them down the Amazon to Para, where they were disposed of. Unfortunately the Jivaro soon learned that these heads were much in demand by white men and began to prepare them for the traders, being by no means particular as to whose head was used, and it is said that advance orders were frequently taken and filled. Certain it is that now and then short-haired heads bearing mustaches find their way into the market.

In early times the Spaniards, and after them several South American countries, passed laws with severe penalties for any one known to have prepared one of the heads; but it was difficult for the law to reach the transgressors and not much seems to have been accomplished toward stopping the practice.

*Assistant Curator of Peruvian Archaeology, American Museum.



MARIE SKŁODOWSKA CURIE

*Honorary Fellow of the American Museum of Natural History and
Honorary Member of the New York Mineralogical Club*

A picture taken in her Paris laboratory shortly before her departure for America, showing her concentrated on her scientific investigations that have already enriched the world with one of the greatest discoveries of all time. With the gram of radium recently presented to her, Madame Curie will have the opportunity of pursuing her research under conditions not hitherto enjoyed, with results that may further amaze the scientific world and redound to the benefit of mankind

SCIENCE HONORS MADAME CURIE AT THE AMERICAN MUSEUM

ON the evening of May 17, in the Auditorium of the American Museum, which was packed to capacity, three scientific bodies,—the New York Academy of Sciences, the American Museum of Natural History, and the New York Mineralogical Club,—united to do honor to Madame Marie Curie, “a lady whose name,” to use the eloquent words of Dr. George F. Kunz, who presided on the occasion, “will live long, long after those who have aspired to fame ostentatiously or otherwise, will all have passed away.”

In addition to the tribute paid from the platform to the genius of Madame Curie by such distinguished scientists as Professor Henry Fairfield Osborn, Dr. Robert Abbe, Professor Alexander H. Phillips, Professor Michael Idvorsky Pupin, and Doctor Kunz, supplemented by the enthusiasm of an audience that gave warm expression to its appreciation of her achievements, two testimonials were presented to the discoverer of radium,—the one a certificate signifying her election as an Honorary Fellow of the American Museum of Natural History, the other conferring upon her Honorary Membership in the New York Mineralogical Club. In bestowing the former, President Osborn said:

“My pleasant duty tonight is to extend the hospitality of the American Museum of Natural History to Madame Curie and to announce that, by unanimous vote of the scientific staff and unanimous vote of the trustees of this institution, we have elected Madame Curie an Honorary Fellow of the American Museum of Natural History. I have in my hand the certificate of membership and I would present this certificate to Madame Curie with the statement that she is the first woman to receive this honor; that it is given in recognition of her great discovery in the fields of physics, of mineralogy,

and of chemistry; and that we give it with the greatest enthusiasm because of the fundamental character of her discoveries in these fields.

“Madame Curie, may I greet you as an Honorary Fellow of the American Museum of Natural History?”

In presenting the certificate of honorary membership in the New York Mineralogical Club, a ceremony which took place toward the close of the evening, Professor Phillips spoke as follows:

“The New York Mineralogical Club, by unanimous vote, at the annual meeting of the organization, on the evening of April 20, 1921, at the American Museum of Natural History, desiring to express its fullest appreciation of Madame Curie and her transcendent service to humanity through the discovery of radium in the year 1898, and many great contributions to radial knowledge since, hereby confers Honorary Membership, with life tenure appended thereto.

“It gives me great pleasure to present this, Madame Curie, and the three organizations that arranged this meeting are here to honor you, Madame Curie, and to show their appreciation of your great services to humanity.”

Madame Curie then arose and, speaking with the modesty that is characteristic of greatness, said:

“I am very grateful to the New York Academy of Sciences, the New York Mineralogical Club, and the American Museum of Natural History, for this beautiful reception and for the recognition of my work.

“I cannot say how happy I am that I was permitted to be the discoverer of radium, but I would like to remind you of the names which are associated with this, of which you know many,—as Sir William Ramsay, Berthelot, Rutherford, Soddy, Becquerel, Abbe, etc.

“Then I would like to say how deeply I am moved by the beautiful progress

of the medical application of radium, of which you have just now heard from Doctor Abbe, and we must remember that the success of that is due, not only to the discovery itself, but also to the splendid efforts of distinguished specialists which were made and especially by Doctor Abbe, and we must be thankful to all of them, just the same as to the discoverer."

Dr. Robert Abbe, alluded to in Madame Curie's address and introduced by Doctor Kunz as "one of our first surgeons to use radium, and one of the first to realize that successful as he was with the knife, it was possible to avoid using the knife by using other means," had given earlier in the evening an impressive account of the therapeutic uses of radium.

"What is the present status of cancer *versus* radium and X-rays?" Doctor Abbe answered the question he had himself propounded:

"The biological science has furnished us with a classification of malignant diseases, which has gradually been modified to malignant and semimalignant—all of them antagonistic to life; some of them curable, some of them not *yet*. The obstructionist surgeon still says, 'If you speak of a wart or a small tumor, oh, I can cure that; I can cut it out or burn it out with caustic.' That sometimes helps the patient but never cures the disease. It simply removes it.

"Now we have put in our hands an invincible weapon, a little tiny tube of radium—no larger than a small penholder. The diseased tissue of a tumor isn't cut out; it isn't burned out; it is simply showered with a little fine peppering of radium energy,—little electrons of negative electricity. What happens? Nothing, for a week—but in a month, the tumor has gone. It has melted away, and thereby the disease has been made to cure itself.

"Now, as to the nature of the various things that radium will cure. The

gravest forms of cancer in the smallest areas we can find it, say, no bigger than rice grains, are easily cured by radium. The diseased cells are restored completely and become part of a healthy structure, but in larger masses it is impossible to say at the present time that it can be cured. We can reduce it, but to say we can effect a cure is to claim too much. It takes so many years to demonstrate a cure that we wait patiently. The people cannot be more eager than the surgeons and doctors to find a remedy.

"Meanwhile, is it nothing that a wart can be cured? Is it nothing that a young woman had lost her beautiful singing voice? Then her breathing became obstructed as her larynx filled up with warts. Surgery has never been able to cure that. The warts always come back.

"Eight years ago a young woman with a beautiful singing voice and a throat full of such warts had a radium tube put in her throat for half an hour. Two months later the warts had gone. Today, after eight years, her voice is more beautiful than ever.

"Is it nothing that a little, three-year-old girl had a tumor growing in her tongue? Was it cancerous? No. *Lympho sarcoma* it is called; destructive to life but not cancerous. It was cut out; it came back. The surgeon knew it was a serious case. It was then burned out with caustics; it came back. Then there was a conference of surgeons and they said to the distracted mother of the child: 'There is only one thing now that surgery can do; we must cut the tongue out unless radium can save it.' That little, malignant tumor was pinched between two tubes of radium for twenty minutes. In six weeks, the tumor was gone. Two weeks ago I saw that young girl of thirteen years. She was the picture of health (she was three years old when the radium was applied), and her mother was perfectly happy.

"Is it nothing that a young man of seventeen with a tumor on his jaw should have been restored to health? Eighteen years ago, when I had one of the first two tubes of radium that Madame Curie allowed to come to America¹, a young man with a diseased jaw came to me. I used the radium for half an hour upon it. The jaw on one side was replaced by the tumor (destructive *Myeloid sarcoma*), and the teeth were loosened and separated. I put the radium upon the tumor and into it. In two months it was rapidly changing for the better; the bone was getting hard; the jaw was solid; the teeth were firmly embedded in the jaw. In six months the tumor had shrunk away. As years went by, that tumor and all indications of it utterly disappeared. Marvelous! That very large, solid tumor shrank back completely and the jaw became of normal size. That young man today is married and has four children, and his jaw is as solid and beautiful on the side where the tumor was as it is on the other side, and all the teeth are solid.

"Is it nothing that a gentleman, one of the best scientists in this country, came to me two years ago, with cancer of the eyelid? He had been unable to get it cured and was obliged to give up his work; would radium cure it? I used radium upon it for half an hour; today it is perfectly well. Last week he sent me a bundle of checks, gathered from the men with whom he is associated in his work, \$308, given in gratitude to Madame Curie to swell that little fund for her. Life is full of dramatic incidents. When he was cured, he said, 'You didn't notice my other eye, Doctor?

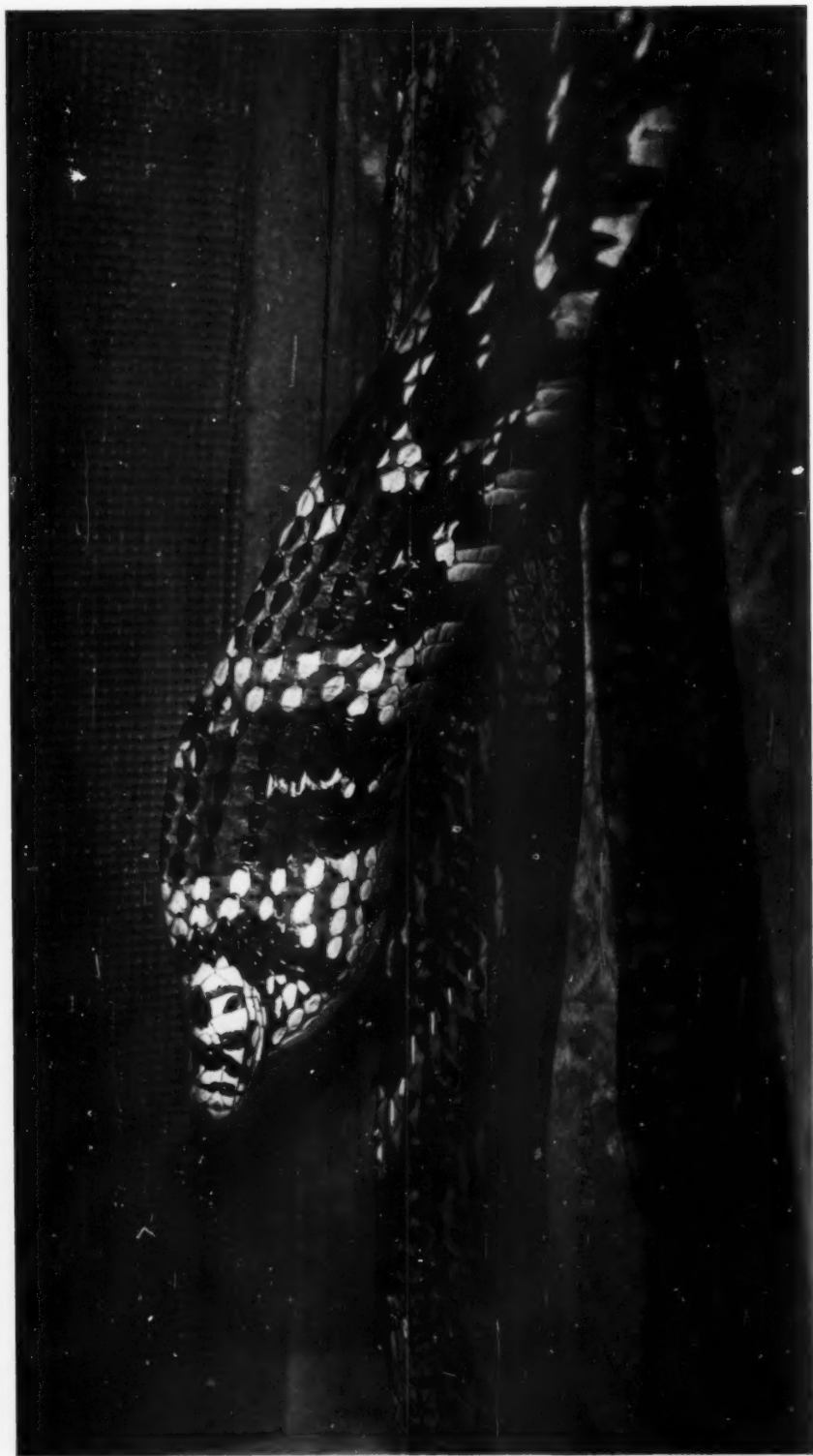
It is a glass one. I lost that eye when I was a boy.' Those are the dramatic things that occur every day. Thousands of the smaller tumors, many forms of what has always been considered incurable, are being easily cured by this wonderful radium. It seems reasonable to expect that if Madame Curie can be equipped with the beautiful laboratory that is being thought of, and can be free from distractions, so that she can work with her accustomed concentration in quiet, she will be able to reveal something new, something that will help all humanity,—the women of this country especially."

Professor Pupin in the course of his address pointed out that the radiation of radium is not like the radiation of an ordinary luminous body. Positive and negative electrons are sent out by it. "These projectiles furnish the physicist a new key to unlock the secret chambers of nature and to see things which he never dreamed of seeing. You can easily see that an electron like that, the diameter of which is ten thousand times as small as the diameter of an atom, is a beautiful projectile to hit an atom directly and make it vibrate and send forth the new light which we call X-rays, and today we are studying these X-rays with the same ease and the same accuracy with which we formerly studied ordinary light. And what does this reveal? Briefly stated, that in all probability, *matter is electricity*, because the atoms are made up of positive and negative electricity."

Those present listened with keenest interest to the presentation of the various aspects of the subject and rejoiced in being able to do honor to the discoverer of this new element, a woman who has been repeatedly designated "the greatest living scientist."

Considered from the standpoint of the chemist, the mineralogist, the physicist, or the physician, radium remains a substance surpassingly wonderful.

¹Part of this first radium was presented to the American Museum of Natural History by Dr. Edward Dean Adams for the experiments carried on by Dr. George F. Kunz and Prof. Charles Baskerville. It was exhibited at the American Museum of Natural History at that time, the announcement bringing six thousand visitors in one day. This was the first radium used by the Memorial Hospital in its experiments upon cancer. Part of this is still in the possession of the Museum.



AROUSSED, WITH NECK INFLATED

The Central American chicken snake, *Spilotes pullatus mexicanus*, is perfectly harmless, but by inflating the anterior part of its body it is capable of making itself appear very terrifying. The inflating habit seems to have been acquired independently by a number of unrelated snakes. The mechanism is apparently in all cases the same

SNAKES THAT INFLATE

THE SIGNIFICANCE OF AN AGGRESSIVE WARNING ATTITUDE
ASSUMED BY CERTAIN REPTILES

BY

G. KINGSLEY NOBLE

THE American Museum Expedition to Nicaragua in 1916 brought back alive a beautiful specimen of the Central American chicken snake, *Spilotes pullatus mexicanus*, measuring more than six feet in length. Hardly had the creature been placed in a cage when, with a low hissing sound, it drew in a long breath, and in another moment had inflated the whole anterior region of its body. The snake was very nervous in its new environment. With wide open mouth, it lunged forward at any one who approached close to the wire netting of its cage. At the same time it beat with the end of its tail against the cage wall, producing a dry and whirring rattle that reminded one instantly of the danger signal of the rattlesnake. This whole performance,—the swollen neck, the vicious lunges, the vibrating tail,—was sufficiently startling to make even the most assured hesitate before drawing near to this entirely harmless creature.

It must be emphasized that this impressive bulging of the neck region was a true inflation, not a mere spreading. Still, the swollen chicken snake could not fail to remind one of the deadly cobra, which, with widely distended neck, rears well up before striking. The cobra's hood, however, is different in character from the inflated neck of our chicken snake. In the first place, it is flattened in a horizontal plane. Of more importance is the fact that it is spread by a series of elongate ribs and not just ballooned into shape as would seem to be the case in our chicken snake.

Many snakes are able to flatten their heads and to spread their necks widely without the aid of any specialized mechanism such as is possessed by the cobra. The "threatening" attitude of our spreading adder, *Heterodon contortrix*,

is known to many boys living in our eastern states. The habit is not a common one among snakes in general. It seems to have been acquired independently in different groups throughout the world. *Liophis epinephelus* and *Ninia atrata* in Central America, *Ithycyphus*¹ in Madagascar, *Tropidonotus piscator* in India, *Pseudoxenodon* in China and *Macropisthodon* in the East Indies flatten their necks remarkably when disturbed. None of these snakes is poisonous. The old myth that a poisonous snake may be distinguished by its flat, triangular head has not the slightest foundation.

Spilotes is not the only snake capable, when excited, of inflating with air the anterior part of its body. In Siam, there is a large snake, *Coluber radiatus*, with much the same habits as the Central American chicken snake. It lives on the outskirts of the plantations and feeds chiefly on rats. According to Smith,² the snake when disturbed swells its neck and assumes a defensive attitude "with the fore-part of its body thrown into a series of loops, and the mouth widely agape, ready to dash at anything". One specimen of *C. radiatus*, after four months in captivity "was nearly as wild and fierce as on the day it was captured".

In India, Baluchistan, and Transcaspia, there is an inflating snake, *Boiga trigonata*, belonging to a totally different group, Opisthoglypha,—characterized by the presence of one or more grooved teeth posteriorly on the upper jaw. In Africa there are two other opisthoglyphs which have developed this peculiar habit of distending the anterior part of the body with air. One of these, the

¹Krefft, P. 1910. *Blätter für Aquarien und Terrarienkunde* XXI, pp. 460-62.

²Smith, M. 1914. *Journ. Nat. Hist. Soc. Siam*, Vol. I, p. 95.

famous boomslang, *Dispholidus typus*, of South Africa, is the rare exception of a "back-fanged" snake having a bite fatal or nearly so to man. Most opisthoglyphs feed on cold-blooded vertebrates and their fangs are neither long enough nor their poison sufficiently virulent to be dangerous to human beings. According to Fitzsimons,¹ "the boomslang distends its throat and body . . . only when in a furious state of anger". The other inflating opisthoglyph of Africa, *Thelotornis kirtlandii*, has been carefully studied by Müller.² His graphic account may be quoted in part (p. 608, translation):

"If one should annoy the snake, something very remarkable happens. It raises itself, lifts threateningly the fore part of its body and swells its neck greatly. The neck is distended only below by this inflation, so that it appears laterally compressed. . . . The neck of the snake . . . appears in the inflated condition dazzlingly light with dark bands, and I consider it very probable that a natural enemy is in no slight degree terrified by this sudden appearance of the brilliantly banded fore part of the body. . . .

"It is, in fact, a very surprising sight when the snake, which before was scarcely to be distinguished from a liana, lifts up the fore part of its body and shows among the foliage its inflated and brilliantly colored neck. The strangeness of the sight is enhanced by the coloring and the peculiar movement of the tongue. The tongue is a glistening vermilion with shiny black points; the tongue points are capable of spreading apart until they form an angle of almost 180°, and then in turn may approach another until they merge completely. When excited, the tongue, with adpressed points, is stretched far forward. In this position it is held for a long time motionless; then the snake bends the tongue

slowly upward and backward, while the points spread far apart. . . . Suddenly the excited animal lunges forward to strike the disturber of its peace. As long as the object of its anger is present, the snake retains its warning attitude."

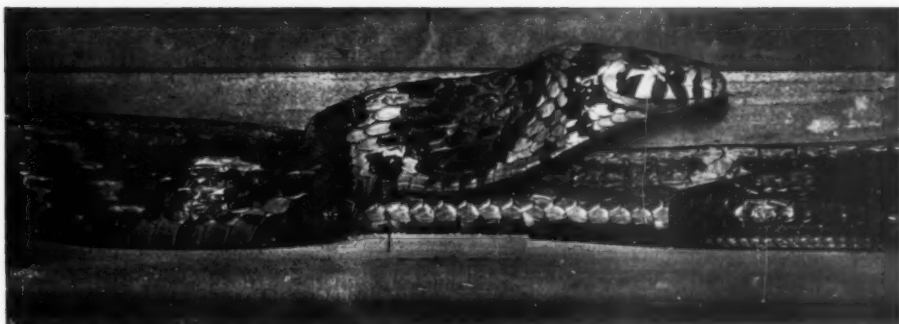
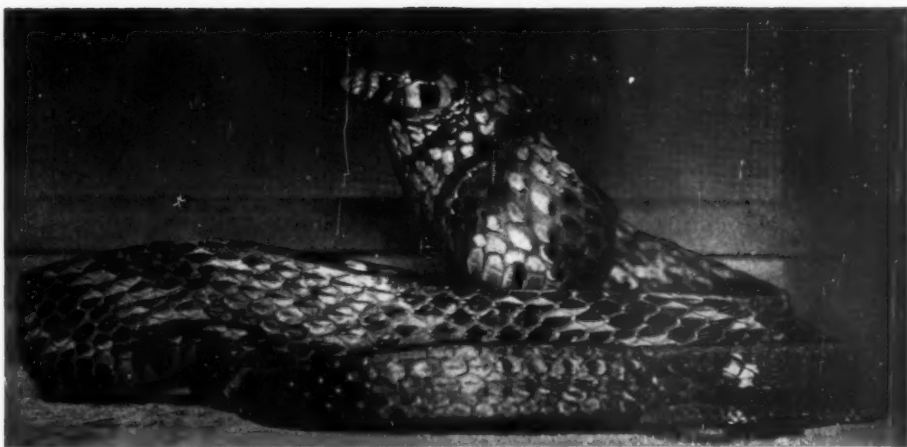
Thelotornis, like most of the opisthoglyphs, is harmless. There is in Africa one species of inflating snake that has a bite "invariably fatal."³ This snake is the black mamba, *Dendraspis angusticeps*. It is not at all related to any of the other snakes that inflate, but is closely allied to the cobras. The black mamba attains a length of twelve feet. It has the disagreeable habit, in certain sections of South Africa, of concealing itself in the foliage of trees overhanging the trails. The black mamba readily swells up when surprised in the open. Inflation, in this case, can scarcely be said to be a very useful habit, for one familiar with the black mamba would not attempt to molest it without taking unusual precautions.

The mechanism by which snakes are able to inflate themselves does not seem to have aroused the interest of the various observers, who have contented themselves in the main with a description of the external appearance of the swollen snakes. Certain chameleons are able to inflate their heads and necks and to assume a very droll, if not terrifying, attitude. The extraordinarily complex mechanism of air sacks and tracheal valves in these reptiles has been fully described in recent years. Inflation in the snakes is as simple as it is complex in the chameleons. In all snakes the trachea is very long and is provided throughout its whole length with cartilaginous rings which are incomplete dorsally. The membrane which covers the dorsal portion of the trachea, connecting the free ends of the tracheal rings on each side, is very much thinner than the sheath of tissue forming the

¹Fitzsimons, F. W. 1912. *The Snakes of South Africa*, p. 511.

²Müller, L. 1910. *Abh. Bayer. Akad. Wiss. München*, Vol. XXIV, pp. 545-626, Pl.

³Fitzsimons, F. W. 1912. *The Snakes of South Africa*, p. 205.



When the cage was approached, this chicken snake would draw in a deep breath and in another moment would balloon out the neck region to twice its normal size. Such an inflation was not mere bluff, for if one approached too close, the snake would lunge forward viciously.

For another picture of the same snake see p. 166



Photograph by H. Lang

This snake, an African "back-fanged" known to science as *Thelotornis kirtlandii*, has acquired the same inflating propensities as the Central American chicken snake. The neck region in the above instance is only partly distended

body of the trachea and binding the successive tracheal rings into a continuous tube. The dorsal membrane of the trachea in most snakes is narrow, not wider than a tracheal ring. In *Spilotes pullatus mexicanus*, *Dispholidus typus*, *Thelotornis kirtlandii*, and, by inference, in all snakes having the power of inflation, this dorsal membrane becomes an enormously expanded sheet capable of great distention. Inflation is accomplished in *Spilotes* by a series of movements. Air is apparently first taken into the lungs; the glottis is then closed and the powerful body muscles contract, forcing the air into the trachea, which balloons out, distending the whole neck region into a great zeppelin-shaped structure. The fact that the distention is limited to the tracheal region explains why the whole body is not inflated but only the anterior portion. In *Coluber radiatus* and *Thelotornis kirtlandii* the behavior seems to be much as in *Spilotes pullatus mexicanus*. The boomslang, however, is apparently able to inflate its trachea and lungs, at the same time distending the whole body until it appears like an elongate toy balloon.

The dorsal membranous portion of the trachea seems to have undergone parallel modification in these unrelated groups of inflating snakes. This is not the only type of tracheal modification found in the snakes. In a number of unrelated families, the lung sends a diverticulum, or tracheal lung, forward along the dorsal membrane, which usually becomes split into two halves for nearly its entire length, as in the case of the rattlesnake and the copperhead. The presence or absence of such a diverticulum has been used as a basis of classification. But the whole subject is much in want of further study. Cope¹ states that all the solenoglyphs,—*Fer-de-Lance*, copperhead, etc., possess a tracheal lung. The bushmaster, *Lachesis mutus*, has been placed until recently in the same genus as the *Fer-de-Lance*. I can confirm Cope's statement that the *Fer-de-Lance* and most of the solenoglyphs possess a well developed tracheal lung. The bushmaster, however, has no vestige of such a structure. *Trimeresurus gramineus*, *Agkistrodon mokasen*, *Crotalus atrox*, *C. terrifi-*

¹Cope, E. D. 1894. *Proc. Amer. Philos. Soc.* Vol. XXXIII, p. 222.

cus, etc., generally recognized as relatives of the bushmaster, possess a large diverticulum from the lung opening into the trachea for nearly its entire length. This discrepancy will probably be accounted for when the anatomy of the bushmaster is well known. It may be that the bushmaster has no close affinity to the other solenoglyphs.

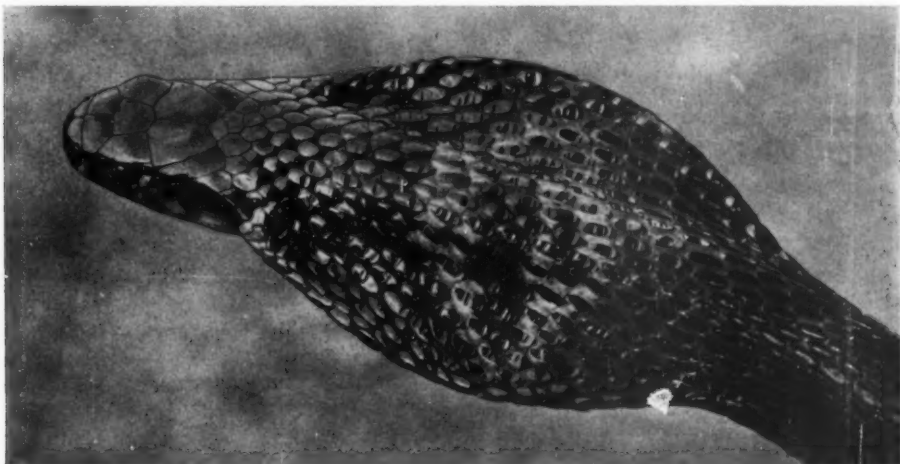
It seems obvious that the tracheal lung and the expansible trachea have each arisen independently a number of times in unrelated groups of snakes. The boomslang and the Central American chicken snake have no close affinity to each other or to the black mamba. The dorsal membrane of the primitive trachea was susceptible to change, and parallel modifications have occurred. Other reptiles besides the snakes exhibit many impressive examples of parallelism in adaptation.

It has been mentioned that the warning attitude of *Spilotes* consisted in part of a vibration of the tail. This habit crops out in many unrelated groups of snakes. The case of the rattlesnake needs no further comment. Many snakes, however, devoid of a rattle, agitate their tails when annoyed. Our common king snake, *Lampropeltis getulus*, is an

excellent example. Several of our Colubers, such as the black snake, have the same propensity. Other neotropical snakes besides *Spilotes* vibrate a rattleless tail. *Oxyrhopus coronatus* and *Drymobius boddaertii*,¹ two common and harmless forms, whip their tails against leaves or other vegetation. These manifestations suggest that the rattlesnake may have vibrated its tail long before it acquired the habit of leaving the tip of its shed skin attached to its posterior end to form with the tips of previous molts the familiar rattle. There is no doubt that the rattlesnake is a very nervous creature, delicately adjusted to its environment. Its vibrating tail seems to be an outward sign of its inward discomfiture over the intruder's presence. The Central American chicken snake vibrates its tail, too, and probably for the same reason.

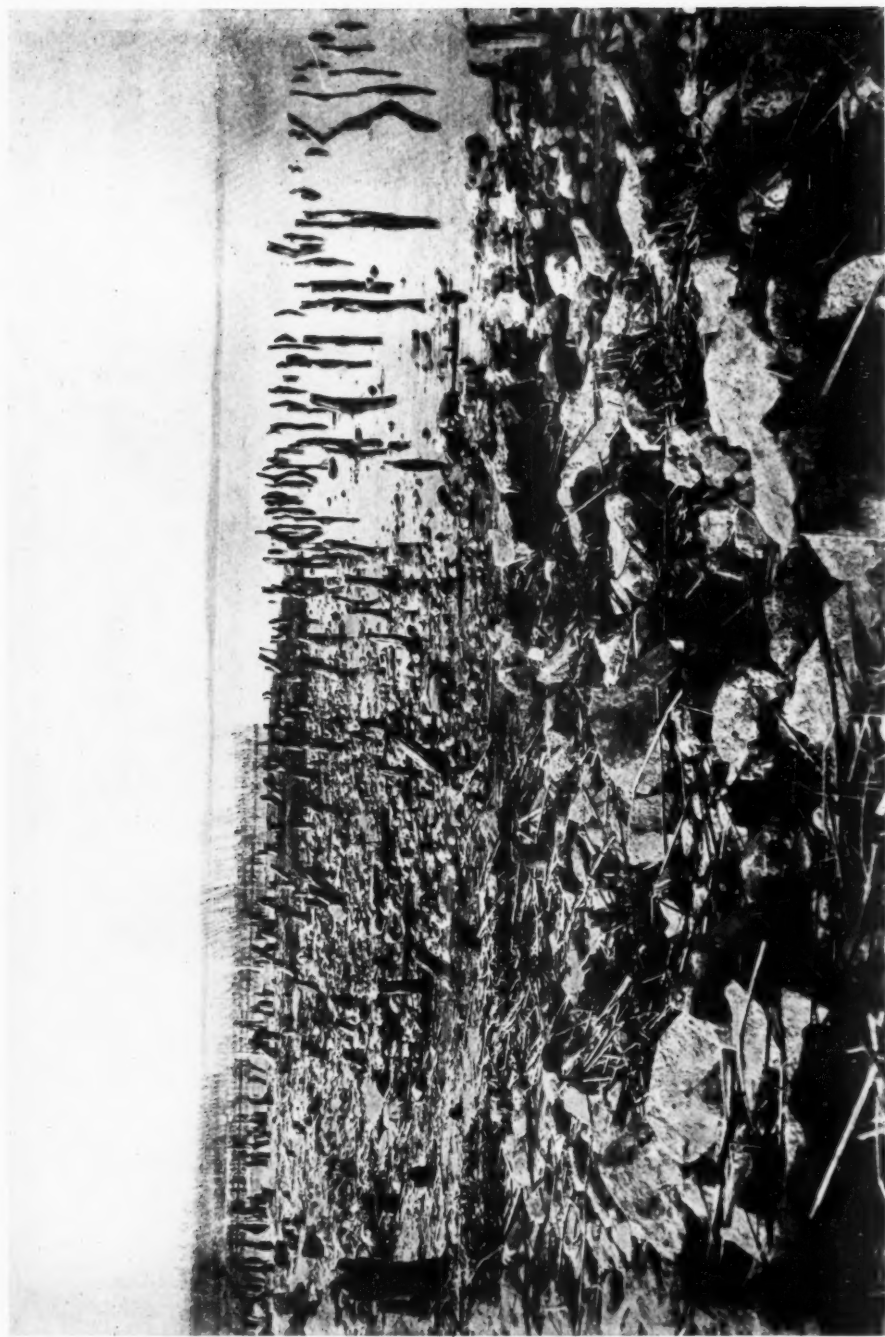
The inflation of the body and the agitation of the tail are both indications of uneasiness. Both phenomena may be called warning attitudes but it still remains to be shown that such actions are not simply manifestations of an uncomfortable nervous state produced by the presence of some disturbing factor.

¹Mole & Urich. 1894. *Proc. Zool. Soc. London*, pp. 490-518.



Photograph by H. Lang

An African cobra, *Naja melanoleuca*, in attitude assumed before striking. The cobra does not inflate; its hood is spread by means of elongate and moveable ribs



Courtesy of M. Forbin

REMAINS OF ANCIENT PILE-DWELLER VILLAGE, LAKE MORAT, SWITZERLAND

This Neolithic village has only very recently been laid bare by the receding of the waters, due to prolonged drought. The site chosen is typical, namely, a broad, shallow margin of the lake. Wherever the bottom was too hard to drive the piles very deep, stones were thrown in to help maintain them in an upright position. On the platform supported by these piles the houses composing the village were erected, and the whole was usually connected with the shore by means of a causeway. This particular village was more than twice the indicated dimensions

SWISS LAKE-DWELLER DISCOVERIES

BY

N. C. NELSON*

A FEW weeks ago the American Museum of Natural History received from a European friend, Monsieur L. Forbin, of Paris, two photographs of a newly exposed pile-dweller station on the shore of Lake Morat, Switzerland. It appears that the water in the Swiss lakes is unusually low this year, owing to "the absence of rain in Western Europe for several months" past. As is well known, it was a similar accident which led to the original discovery of these remarkable repositories of antiquities in 1854, and it is to be hoped that the present circumstance will lead to new and precise investigations. One of the photographs is here reproduced and the facts of the case with illustrations, M. Forbin writes, will appear shortly in *L'Illustration*.

Lake Morat, it may be explained, is a comparatively small body of water situated between the cantons of Vaud and Fribourg, a short distance east of the lower end of Lake Neuchâtel. M. Forbin writes that the existence of about twenty Neolithic villages in that lake was known previously, but that this is the first time in modern history that their remains have been visible. Several of these sites, it may be added, have already been worked in a submerged state, and the collections in the American Museum contain specimens from the station known as Greng. As a matter of fact, the American Museum's Lake-Dweller collections, totaling more than 1300 catalogue entries, represent the arts and industries of no less than twenty-three stations, some from each of the principal lakes. The material ranges over both the Neolithic and the Bronze ages, the Iron Age alone being unrepresented. When this Iron Age material shall have been procured, the exhibits in the Old World section of the archaeological hall will furnish

a complete demonstration of all the principal steps in the evolution of human culture, in so far as this can be demonstrated by material evidence.

In a general way the Swiss Lake Dwellings are to the Neolithic and Bronze ages what the French and Spanish caves are to the Palæolithic Age. That is to say, the more or less stratified Lake-Dweller remains furnish almost our only indisputable proof of the order of development of the various arts and industries for the culture periods covered. When man at the end of the Palæolithic stage left his cave habitations he became a roamer once more, or at least he ceased to live on the same spot for any really long period of time.

The shell-heaps along the shores are in some degree exceptions to this statement, although in reality they cover only the introductory phase of the Neolithic. In Denmark, for example, where the nature of the shell-heaps was first discovered and where the chronological arrangement of antiquities is an old story, the ordering had to be done ultimately not on the basis of stratigraphy but on the basis of what is called a typological study of the implements. To give an illustration, there are found in Denmark no less than five types of axes of widely different forms and finish and obviously not of the same age. By an intensive study of these different forms it was determined that they could be derived by modification the one from the other only in a certain definite order. This order furnished the key to the relative antiquity of the various monumental remains like dolmens, passage-graves, cist-graves, and so on. It was investigation of this general character also which enabled the Scandinavian archaeologists to announce, long before it was actually proved, that man at first made his

*Associate Curator of North American Archaeology, American Museum.

implements of stone, later on of bronze, and finally of iron. Modifications, or rather expansions, of this so-called three-period scheme have been made, but the general order still holds.

In Switzerland, as has been stated, the various successive stages of art or of implement manufacture were actually laid down in the lake mud in stratified order. There are instances in which the pile dwelling burned down and was replaced several times, silt meanwhile collecting to keep the remains from each successive village somewhat apart. A finer arrangement between man and nature for telling his story to his successors could hardly be imagined. And yet much of this valuable stratigraphy has doubtless been destroyed, owing to the roughshod methods that have been used at times in dredging under water for the relics. When, therefore, as has now happened, a station is raised above the water level in such a way that the deposit can be worked by hand, it is an event of real importance. The difference between collecting with grappling hooks and collecting by hand makes all the difference between antiquarianism and archaeology.

The first recorded discoveries of Lake-Dweller antiquities took place at Ober-Meilen on Lake Zürich as long ago as 1829, but it was not until 1854, at a time of extremely low water, that implements and upright piles were found in sufficient quantities to impress their significance upon the finders, who were workmen and lake-front property holders trying to reclaim some of the dry beach. By 1855, finally, the antiquarians, among them Dr. Ferdinand Keller, of Zürich, took hold, and the results obtained since that day have been little short of marvelous. More than two hundred stations have been discovered in the Swiss lakes alone and the quantity of relics found in them is almost unbelievable, as is also the state of their preservation. The remains include not only objects of such

comparatively imperishable material as stone, pottery, bronze, and iron, but also objects of destructible material like bone, horn, and wood. Artifacts of wood are almost unknown except when hidden away in dry caves or buried in desert sands; but here they have been preserved in the silt of the lake bottom for all of 6000 years.

The impetus that these discoveries gave to archaeology cannot be estimated at this time. The preceding half century had been one long struggle to gain acceptance for the bare facts of the science. Danish antiquarians, having to make no extraordinary claims for the antiquity of man, won the first battle of the series. In England various workers from 1797 on had announced the discovery of implements made at a "remote period" and by "people who had not the use of metals" but it was not until 1858 when Charles Lyell, Prestwich, Owen, Hugh Falconer, and other authorities became convinced of the facts that the turning point came. In that year also Boucher de Perthes, of Amiens across the channel in France, through the support of these same Englishmen, won his fight, which had lasted for more than a quarter of a century.

Altogether, the decade just preceding the publication of Darwin's *Origin of Species* is the most interesting in the whole history of science, and it was during this decade that the Swiss Lake-Dweller remains were discovered. To one more than ordinarily interested in archaeology the most valuable result of it all has been the fact that classical scholars have let up somewhat on parsing and scanning as well as on the art of spinning theories of civilization out of their own inner consciousness and instead have gone to work with the spade to find out what the culture of classic lands really was like. We are in a fair way now to present the unbroken story of human progress,



PHOTOGRAPHING GREAT HORNED OWLS*

BY

FRANK OVERTON, M. D.

EARLY in March, 1915, I found a nest of the great horned owl in an old crow's nest fifty feet from the ground in the top of a pitch-pine tree about two miles from Patchogue, Long Island.

Unique experiences with the birds shed light on their methods of attack, and tend to confirm their reputation for wisdom.

Three young birds were hatched—one large, one medium-sized, and one runt. Their food for the first week or two was rabbits, and at every visit which I made I observed half a rabbit in the nest. After that time, the food was principally perch, which could easily be obtained from a pond near by. A hatful of fins and scales soon accumulated in the nest.

The old birds demonstrated their parental devotion at almost my first visit. As I was balancing myself with uncertain footing, on the topmost limbs of the tree, trying to take a picture of the young with a Graflex camera, one old bird suddenly struck a heavy blow upon my head which nearly knocked me out of the tree. My scalp was torn,

and my head ached for the rest of the day. I can readily imagine what happens to a rabbit which is struck as I was. I then turned up my coat collar and took the bird's repeated attacks upon my head and shoulders, and succeeded in obtaining photographs of the bird, both coming and going. At the end of an hour my thick canvas coat was pretty well torn, and my shoulders were bleeding from the effects of the attacks. I next stationed an eager boy, protected with a thick canvas helmet, beside the nest, while I climbed the next tree, about forty feet distant, and photographed the bird as it attacked the boy repeatedly. The shutter was set at $\frac{1}{800}$ second and blurred the picture just enough to give the impression of motion. A study of the photograph will show that the bird attacks with its feet and not with its bill or wings.

When the young were about three weeks old, a heavy storm of wind and rain one night destroyed the nest and killed the smallest young bird, but the other two were found on the ground uninjured, and were being fed by their parents. I made a burlap hammock

*Article and illustrations copyrighted by Frank Overton, 1921.

nest beside the original site and placed the young birds in it, and the old birds accepted it as if nothing had happened.

The old birds usually sat in some tree within a radius of about two hundred feet of the nest; but a few times they sat for their photographs within fifteen feet of the camera. Their attacking flight was absolutely silent, but they often preceded the attack by a few hoots and a brief pose with the head and body horizontal.

As the birds sat in the top of an adjoining tree, I frequently observed them ejecting the undigested parts of their meals. The ejecta were not formed pellets, but were semi-liquid.

The birds afforded no end of fun. The old ones were good for a fight on any afternoon, and it was my favorite amusement for weeks to photograph the attacking birds two or three afternoons each week. I banded the two young birds when they were ready to

fly, and during the following Christmas holidays I received word that one of them had been caught in a steel trap at a duck ranch at Moriches, twelve miles from its home nest. The proprietor of the ranch was so interested in the bird that he kindly set it free.

The old birds, or their doubles, nested again the following spring in another crow's nest about a mile from the first nesting site, and again they showed the same willingness to fight for the defense of their one offspring. After my first visit, a bad boy tore the nest to pieces and took the young bird home, and I was a week in locating it. I then took the young bird and made a hammock nest for it in a tree about a quarter of a mile distant across the swamp from its first nest site. The old birds soon found the young one and fed it as if it had never been disturbed. It is doubtful if any other species of birds would have had sense enough to do that.



The great horned owl, savage and unsocial by nature, is as a rule irreconcilable in captivity. If there is stoical passivity in the attitude here assumed, the glint in the bird's eye suggests its readiness for combat if opportunity offers. This is the owl that was caught at a duck ranch in Moriches and subsequently released. At the time the picture was taken the owl was nine months old.

THE GREAT HORNED OWL*

REMARKABLE CLOSE-RANGE PICTURES OF THIS EXCLUSIVE BIRD THAT IS
SO RESENTFUL OF HUMAN INTRUSION AND, WHEN DISTURBED,
PROVES ONE OF THE PLUCKIEST OF FEATHERED ANTAGONISTS

BY

FRANK OVERTON, M. D.



In its search for a nesting site the great horned owl is not indifferent to the shelter offered by hollows in trees. As these, however, are rarely spacious enough to give entrance to the large adults, the deserted nests of other birds, such as those of the crow or of the hawk, are often used instead. Even the nests of squirrels are occupied. In the top of the pitch-pine tree here reproduced, an old crow's nest is housing as new tenants the family of owls depicted in the illustrations that follow

*Text and illustrations copyrighted by Frank Overton, 1921.



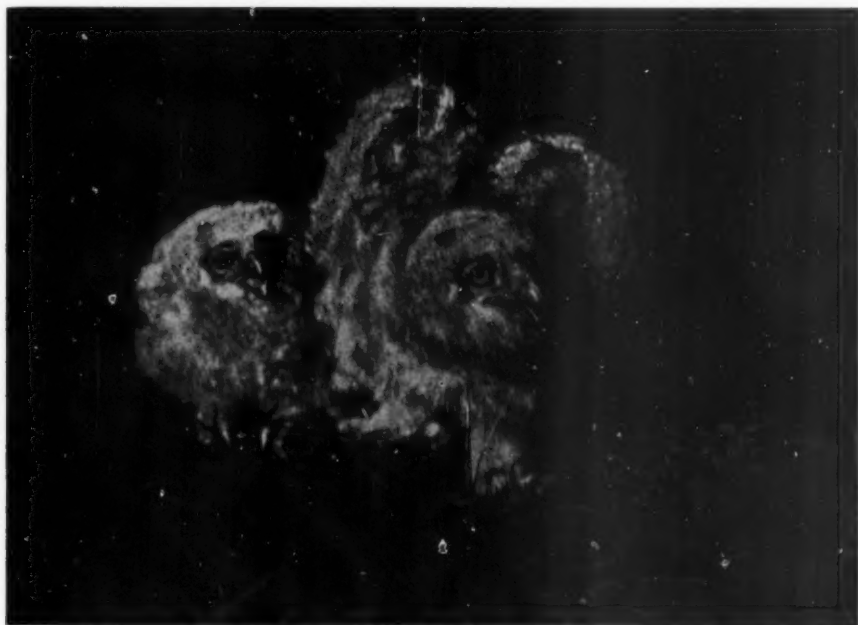
Three young birds—one large, one medium-sized, and one runt—were the zealous care of their parents, who never hesitated vindictively to attack any one threatening the security of the brood



Numerous rodents fall victims to the onslaughts of the great horned owl, but birds too and even fish succumb to its voracity. In this picture the substantial carcass of a rabbit would seem to offer a rather formidable feast for the downy banqueters, yet such is the food given the newly hatched



A sanctimonious attitude that belies the young bird's real nature

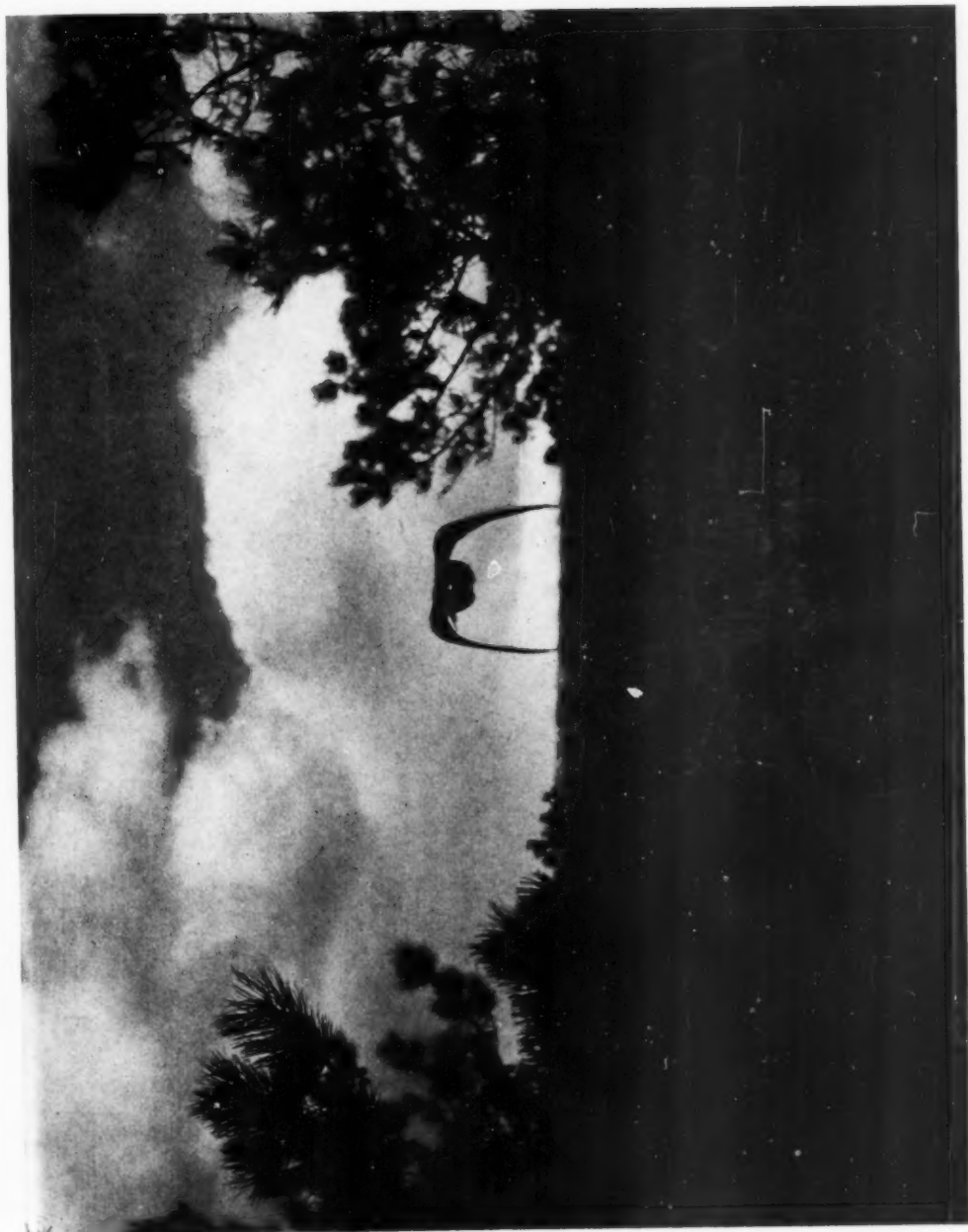


The real nature of the bird asserts itself



THE OWL WINGING ITS WAY TO AN ENCOUNTER

The bird is about to attack the photographer, who had taken position beside the nest



A FLIGHT IN RETREAT

The bird had attacked the photographer from behind



STAGES IN THE ATTACK OF THE GREAT HORNED OWL

As the bird approaches its animal victim, or in this case a man who has incurred its wrath by standing beside its nest, its legs are stretched forward tensely and it is with these, and not with the bill, that the thrust is delivered



IN ANGRY ASSAULT

In the picture at the left the bird is shown delivering its blow upon the thick canvas helmet worn for protection by the intruder. The photograph on the right represents the owl in its onrush immediately after striking the man. This persistent combatant does not content itself with a single demonstration of valor but again and again flings itself with outstretched legs against the person that has aroused its anger



A young bird sitting for its portrait



The same bird snapped in action

NOTES ON THE SCIENTIFIC MUSEUMS OF EUROPE

BY

W. D. MATTHEW*

HOW do the European museums compare with ours? What are they like? And especially what happened to them during the war?

These are questions that everyone interested in museums must have asked. It has been very difficult to answer them. During the war, and since, we had various contradictory reports in newspapers and letters. One hardly knew what to believe. It seemed likely enough that museums would be utterly neglected in the stress of war and after-war conditions, as they had been pictured to us, and fortunate indeed if their treasures were not stolen or openly looted. Yet, after all, if we stopped to think, we were considerably absorbed in the war ourselves, and still our museums hadn't been disrupted or even seriously neglected. Granting that conditions were much worse over there, it seemed likely that the alarmist rumors we had heard were a bit exaggerated.

The following notes were made during a visit to various European museums in the autumn of 1920. I was commissioned by the American Museum to arrange exchanges of publications, specimens, etc., and to renew as far as possible the old relations of coöperation in scientific work which had been interrupted by the war. Mostly the notes are extracts from letters and reports sent home in the course of my visit and are to be understood as random impressions from what I actually saw, chiefly the palæontological collections, and not the results of a systematic study of the museums as a whole. During the three months I visited thirty museums in Sweden, Germany, Austria, Italy, Switzerland, France, Belgium, and England, and the time was taken up mainly with study and notes on the fossil collections

and conferences regarding exchanges and related subjects. Most of these institutions I had seen twenty years ago, and the changes noted reflect the great scientific progress in the years preceding the war, as well as the effects of war and of post-war conditions.

Generally speaking it was a great relief to find so much scientific activity and progress in spite of the heavy handicaps under which the museums have suffered in recent years. It speaks well for the energy and devotion of our scientific colleagues across the Atlantic that, although often lacking support and hampered by the enormous rise in wages, living expenses, and the cost of materials, they have contrived to guard and maintain the collections in their charge, to continue their researches, and with varying success to keep the museums open to the public. The best conditions are to be found in the neutral countries, Sweden and Switzerland. Vienna has been hardest hit, yet even there less irreparable injury or loss has been suffered than one might expect. One may well hope that, with a return to normal economic conditions, the old activities of the museums, in Western Europe at least, will be resumed before many years have passed. There can be no question that such aid and encouragement as we can give on this side will go far to quicken their recovery. In science even more obviously than in commerce the prosperity of each institution works to the advantage of all. Each has its special field of research and discovery and contributes its quota to the advancement of science as a whole.

Stockholm, Sept. 17, 1920. . . . The new Natural History Museum is a very fine building about three miles north of the central railroad station and outside the built-up city. (Stockholm is peculiar in having no suburbs;

*Curator, Vertebrate Paleontology, American Museum.

it is all large, solidly built business and apartment buildings to a certain line and beyond that open fields. There are no small private houses). The museum has three great divisions of which the geological-palaeontological department occupies the center. Professor Gerhard Holm is in charge of this division. The installment, completed within the last five years, is in every respect an admirable one. The hall is well lighted; the cases are well placed and spaced, so that everything in them has good light and no reflections.

Table cases are used very largely, and in these fit, three to a side, shallow trays about two feet square with narrow wooden sides one inch deep. These trays also fit in the closed racks beneath the cases, so that it is very easy to shift and retire or remove material. Trays are lined with cartridge paper of suitable color for the exhibit. This last detail is to be compared with our method of painting the bottoms of cases. It seems a much cheaper and more flexible method. The finish of the cases is plain varnished wood. Ours is much handsomer—worth the extra cost, I think. Glass shelves are used throughout on the high cases.

Descriptive labels are very freely used—even more than has yet been done in our department (Vertebrate Palaeontology). The style and the scope are very like ours. Those in charge have made admirable use of the casts and models purchased from us, giving full and prominent credit to the museum.

In comparison with other exhibits they have made a very large use of casts and models among the vertebrates, as well as of photo-enlargements and large, simply drawn diagrammatic wall charts, all of them well filled out with explanations, etc.

The most important original collection is the South American Pampean material brought by Nordenskjöld from the classic Tarija valley in Bolivia, . . . somewhat different from the Pampean of Buenos Aires. The most interesting specimens are two fine skulls of *Mastodon andium*, with the tusks in position . . .

At Upsala I had a very friendly reception from Dr. Wiman and his colleagues, and saw the first consignment of the Chinese fossils received from Dr. Andersson at Peking. Dr. Wiman is not the usual Swedish type. He is small, dark, quick, and active, very French in type. He reminds me very much of Zittel but is a more vivid personality. They have wonderful material from Spitzbergen at the Upsala Institute: Devonian fish and Triassic fish and amphibians. Dr. Erik Stensjö is working up the fish in a very admirable manner. The amphibians Wiman has done. The third member of the group whom I met was Dr. Zdansky, an Austrian-Pole, a pupil of Abel's. He is really a specialist on fossil mammals but is not allowed by the Chinese government to study these Chinese fossils because he is an enemy alien!

At Stockholm I met Dr. Leche, a very polished, courteous, and rather aristocratic old gentleman, with whom I had a very profitable talk. He is still working actively on the Insectivora. He is a great admirer of the American Museum,

especially of Gregory, whose contributions on the "Orders of Mammals," etc., he regards as of a very high order. . . . Prices of everything in Stockholm are quite as high as in New York, even allowing for the exchange. Transportation charges are fearfully high. Railroad rates are from four to five and a half cents a mile, second class, but third class is very good in Sweden. . . .

Berlin, Sept. 26, 1920. . . . The Natural History Museum is greatly changed in its contents since I saw it twenty years ago, but not improved in its installation, which is mostly quite out of date, and at present very dingy and dirty owing to lack of care. A large number of limb bones of the Tendaguru collection have simply been laid out on the floor behind the cases and roped off. The most complete specimen is the *Dicraeosaurus*, a nearly complete series of vertebrae from cervicals to caudals inclusive. . . . Among the mammals they have some interesting Proboscidea. . . . This whole town looks miserably dingy and dirty; very much down-at-heel compared with the Berlin of twenty years ago, when I saw it before. The people look very much run down; a large part of the population, I think, is much underfed. The bread is of wretched quality, heavy, soggy, and full of grit. Prices of everything in the stores, allowing for the present value of the mark (about 1½ cents), are a third to a half lower than in New York; everything, however, is of the very cheapest and most inferior quality.

. . . Branca is no longer in charge at the Museum für Naturkunde, but Pompecki is the head of the Geological-palaeontological Institute, with Janensch as curator, and Reck and Dietrich as assistants. I missed seeing Janensch, who, as they explained to me, was away getting married, but the others were very cordial. Pompecki in particular gave me an entire day and showed me all through the great Tendaguru collection and various other interesting material. I was, he told me, the first foreigner who had seen this collection. It is a magnificent collection, far larger and more varied than I had any expectation of finding, and in preservation equal to the best of our Morrison material. Of their great "*Brachiosaurus*" skeleton I saw the skull and jaws, the entire cervical series with some dorsals and some ribs, as well as the entire fore limb; of the *Dicraeosaurus* an entire vertebral column of one individual from the axis nearly to the end of the tail; pelvis, vertebrae, and limb bones of various other great and medium-sized Sauropoda; a huge series of bones of their *Kentrurosaurus*, representing dozens of individuals and practically every part of the skeleton, but no association; a large number of partial skeletons and parts of skeletons of a small new Iguanodont dinosaur; and various "oddments" representing other types. Theropoda were scarce: two or three series of vertebrae of, I think, doubtful pertinence, and numerous teeth, large and small.

I have grave doubts whether the *Brachiosaurus* is really congeneric with our Colorado species. The little that is available for comparison indicates similar general proportions, but the humerus and the dorsals do not seem to me very

like the same bones in the Colorado beast. The rest of the fauna is widely different from anything in the American Morrison, although often paralleling it in one way or another.

I feel certain from examining this fauna that it is not at all nearly related in any part to our Morrison, but is a separate parallel evolution from some common stock of perhaps Lower Jurassic age. How far the Jurassic dinosaurs of the English Lias, etc., represent this ancestral stock I do not know.

The Berlin museum will have a fine series of duplicates available for exchange, and Pompecki has promised to reserve a first-class set for us and to supplement the originals with casts of certain important parts not duplicated, such as the skull of *Brachiosaurus* (the biggest Sauropod skull ever found, and, I am inclined to add, the best). Of the *Kentruosaurus* they will have duplicates of practically every bone. Pompecki is very anxious to resume the interchange of publications. Neither his Geological-palaeontological Institute nor the general library of the Museum für Naturkunde has any papers from us later than 1916.

At Frankfurt I saw the new *Trachodon* with skin. It is as fine as ours, and supplements ours¹ admirably, showing the skin of the back very nearly complete. I was surprised to see how thin and delicate is the skin of the back and how small the pattern.² I had expected it to show the coarse pattern of the tail, but it does not.

Drevermann . . . is working tremendously hard to put the museum on its feet and keep it going, and to set an example to the city of plain living and hard work as the one and only cure for their troubles. Frankfurt is very different in appearance from Berlin, and I can well believe that he strikes the chief reason in saying that the people here are beginning to get to work again while in Berlin they are still listless and despairing. Drevermann impresses me as a most remarkable man, and what he has accomplished is an inspiration and a lesson to all of us.

He has received nothing from us since 1916, and is very desirous of having our palaeontological papers and also NATURAL HISTORY. He has a very high opinion of the latter, which he regards as the most valuable publication of its kind. He desired me to convey to Miss Dickerson his highest appreciation of the importance and success of her work, which he said he used a great deal and kept always at hand.

I had the pleasure of meeting Dr. Lotichius, who desired to be especially remembered to friends in New York. He and Dr. von Strasse showed me through the modern mammals, an extraordinarily fine and well selected series. An

¹The reference is to the "mummy dinosaur" on the fourth floor of the American Museum. It is most unusual to secure fossils with skin attached. The preservation of the skin is due, it has been surmised, to the exposure of the carcass on a dry sand bank until thoroughly baked and hardened by the sun and to its subsequently being carried off by a sudden flood and buried quickly and deeply in sediment before the skin had time to soften and decay.

²Unlike modern lizards, these dinosaurs were devoid of scales. Instead they were covered by a tessellated surface of little mosaic plates, arranged in patterns of small spots, which, it is believed, corresponded with a color pattern of some sort.

Arctic habitat group just finished is wonderfully well done, an artistic piece.

Munich, Oct. 8, 1920. . . . At Bonn I met Professor Pohlig, and saw the most important specimens of his collection, and enough of the others to get an idea of their size and quality. I found him a rather mild old gentleman, speaking fair English, but our discussion was mainly in German. He was very courteous and pleasant. The University collections, which he personally showed me as well as those of Dr. Krantz, include one important *Pterodactyl* type; nothing else worthy of special note, but the usual fine series of marine reptiles.

Stuttgart: Director Schmidt was away, and so also was Dr. Pfizenmeyer, whom I wanted to meet. Dr. Graeff showed me over all the collections, both those on exhibition and the material temporarily withdrawn. A magnificent *Platcosaurus* skeleton is the prize of the collection, the most perfect dinosaur skeleton that I have ever seen. With trifling exceptions it is complete and uncrushed, the surface of the bone everywhere beautifully preserved. It is from the red and green variegated Knollenmergel (Rhaetic) of southern Württemberg. I visited the quarry later with von Huene. They have casts of the skull and fore-foot, which we can obtain, and I have been urging them to get the whole skeleton cast. From the same quarry came the smaller and much less perfect skeleton of *Scellosaurus*, which is very closely related, and from a lower level in the Trias a skeleton of the quite small *Teralosaurus*, about five feet long, a good deal like the others in construction though placed by von Huene as a pro-Megalosaurus while the larger ones he regards as pro-Sauropoda. The mounting of these three skeletons is eccentric, the pose based upon the Iguana, involving some very obvious disjoining of the articulations.

Besides the Triassic dinosaurs, there is a fine series of Phytosaur skulls, etc., from the Stubensandstein quarries, and a splendid series of ichthyosaurs, crocodiles, plesiosaurs, etc. from Holzmaden, but perhaps the best thing, if one except the dinosaurs, is the fine Steinheim mammoth skeleton,—nearly as large as the *Elephas meridionalis* in the Paris Museum and very complete. Tusks were in place in the skull, the points turned inward as in the Texas mammoth skull we mounted in 1899. . . . The Fayûm collection was rather disappointing. A beautiful *Arsinoitherium* skull and a very fine *Palaeomastodon* (both better than ours) in addition to what has been described.

At Tübingen I met von Huene, who has been extraordinarily kind, giving up practically the whole of three days to museum and field excursions with me. His collection is exceedingly fine in marine Reptilia—the best series in that line that I have seen, although not such choice selections nor so beautifully mounted as in Frankfurt. . . . I visited the quarries from which the Stuttgart dinosaurs and other Triassic reptiles came, also many in Tübingen. The *Platcosaurus* quarry would be well worth further excavations.

In Munich I found the collections vastly in-

creased from the old Zittel days. I think one can say without question that it is the finest museum for fossil Vertebrata in Germany. There is a very fine series of reptiles, and there are far more mammals than elsewhere. . . . The most interesting things to me were Strömer's new fauna from the late Cretaceous of the Baharijeh oasis in Egypt. Only a part is on exhibition as yet, but Dr. Strömer showed me all he had in Munich. A part, it appears, was still in Egypt when the war broke out, and has been detained temporarily by the Egyptian government. . . . It is a more peculiar fauna, decidedly, than the Tendaguru. It is just what one might expect if Africa was isolated during the Cretaceous and the fauna developed independently of the rest of the world. Strömer thinks there is every reason to expect that much more will be found by systematic collecting. Specimens are difficult to secure, being far from water and involving very expensive transport, and his own material is very crudely and roughly collected, although the preparation at Munich is good. . . .

I have hardly ever seen a more keenly intellectual face than Schlosser's. It is interesting simply to watch him talk. Broili was, of course, the same fine, genial chap that he always was; and in observing his methods I understand his appointment to so high a responsibility as the leadership of the Munich collections.

Vienna: I spent three days here, of which the first was mostly devoted to going through the formalities incident to getting away from the city. I have not made much note of this, but the passport and ticket business has been made excessively difficult,—I am told in order to discourage travel, which the various governments do not want on account of the universal scarcity of coal and consequent difficulty in running enough trains to take care of the traffic. For example, to get a ticket from Vienna to Venice I had to apply first at the ticket office in the city, was referred thence to another ticket office, thence to the Italian consulate, thence to an Italian military mission, where I obtained authority to buy a ticket, thence to a third ticket office, where I bought it. All these were in different parts of the city, all involved waiting in line, and none had anything to do with the visé, which I had already obtained after a similar series of delays. No one knows much about these regulations; you have to go from place to place to find out; and they are not always consistent. . . . But all this is aside, as indication of my reasons for not getting through as much as I had hoped to accomplish.

Dr. Schaffer at the Museum and Dr. Abel at the University of Vienna were most cordial. The museum building is a magnificent one. I never saw fossils so luxuriously installed before; and although Schaffer is rather resentful of so much being expended on building that they had no money for specimens, yet it seemed to me that to install the collections in such dignified and grandiose surroundings gave to the visitor an exalted impression of their importance and value. At present the museum is in a very bad way. . . . They have succeeded after

great efforts in getting salaries raised to equal \$500 a year each for himself and his assistants, and on that he says they can get along. But they *must* have aid to meet the necessary maintenance charges. He thinks that with \$480 per annum for this purpose his department can keep up its work and keep the collections in order, setting aside for the present, of course, all thought of purchasing any new material. . . .

I saw a melancholy example of the results of lack of funds in the present condition of the magnificent meteorite collection (which they regard as the finest in existence). Owing to the lack of coal for heating the museum buildings last winter, the protective varnish covering all their sectioned surfaces was badly checked, and the damp got in at the iron and has rusted it very badly. All these sections will have to be re-ground and polished at a heavy expense. Other damage by the cold to alcoholic and other preparations is irreparable. They have a new collection from Samos at the museum, purchased shortly before the war, and none of it as yet on exhibition. It is beyond comparison the finest Samos collection. . . . The collections on exhibition include some fine things from the later Tertiary, of which I have notes; the first good Maragha collection, some fine *Dinotherium* jaws, a fine *Tapirus* skull from the Hungarian Pliocene, etc. . . .

Dr. Abel is one of the most attractive and brilliant personalities I have met. He is very busy with his new department and very anxious to obtain photographs, casts, or specimens of study material for his courses. We can do a good deal in that way for him, and although we have sent considerable material to the museum, the university is so completely separate that he needs all he can get, especially in Equidae and other evolution series. His assistant, Dr. Antonius, has specialized on Equidae, and in my judgment knows more about the later Tertiary and Pleistocene Equidae than anyone in Europe. Abel, also, has had almost nothing since 1914, and had not even heard of our *Diatryma*. He does not want large and bulky or showy casts or originals, for he has no room for them, but he would use a study series very effectively. . . .

At Padua I made acquaintance with Professor Giorgio Dal Piaz, head of the department of geology and a very fine chap. He is doing active work in collecting Tertiary mammals, etc., has published a number of excellent memoirs on the geology and paleontology of Venetia, and has brought together a small but valuable series of fossil vertebrates, mostly Venetian, the best of them Cetacea, except for an important new fauna that he has secured from the late Oligocene of Belluno. . . .

From Padua I came to Bologna, where I met Professor Capellini. He is now a very old gentleman, eighty-seven years old, but still active. He continues by especial dispensation to give his lectures, though far beyond the age limit. The museum has been named and officially dedicated in his honor as the Capellini Museum, and he is naturally proud of it. He speaks very fair English, an unusual thing here—I have had mostly to depend on French—and

is greatly interested in American science. . . . The most important specimen in the museum is the skeleton of *Mastodon arvernensis*. . . . There is also a considerable series of Tertiary Cetacea and Sirenia, including a fine *Halitherium* skull and jaws. There are no other vertebrates calling for special notice.

From Bologna I went to Florence, where I failed to find the director of the museum but persuaded the "technician" to let me see the collections. Considerable material from the Val d'Arno is there, including an especially fine *Mastodon arvernensis*, of which I took notes; they may be able to make casts of certain important types, in return for casts of some of our fossils.

From Florence I went to Rome, where I found nothing of palaeontologic interest, although the historic and prehistoric remains are extraordinarily impressive. Thence I traveled to Naples, where also the interest is history and archaeology rather than palaeontology. I took an excursion to Pompeii, thence to Amalfi, Sorrento, and Capri, and then to Vesuvius,—all very wonderful in themselves but of somewhat remote relations to vertebrate palaeontology. Thence I went to Genoa, Turin, and Milan. At Genoa there is a museum, a fine little building, beautifully situated, but offering nothing special to report upon. Turin was more interesting. There they have a large collection from the Pliocene of Asti and other localities in the neighborhood, including a fine series of mastodon and of the southern mammoth. There is also one of the best *Megatherium* skeletons I have seen. Among the Asti specimens is the *M. arvernensis* which Sismondi restored many years ago (1850). This restoration gives a very good idea of the amount of "constructive imagination" possessed by our predecessors. One does not so much wonder on seeing it that Balzac credited Cuvier with restoring an extinct animal from a tooth. The Sismondi specimen is very incomplete, not at all comparable to the specimen at Bologna later restored by Capellini.

At Milan I found an active, energetic staff, a comparatively new museum, which they are anxious to build up by exchange of originals or of casts, and a considerable amount of interesting material. Included in the collection are some very fine Tertiary Cetacea, some fair Proboscidea, a fine *Megatherium* skeleton, etc.

I searched carefully in the Genoa museum for the cast on which *Rhynchotherium* is based. It was not there; and as everything is placed on exhibition, I am pretty sure that it is not in the Genoa museum. I shall make careful inquiry for it at Geneva.

At Zürich the National Museum is at present shut up tight for alterations, and in the limited time at my disposal I did not succeed in obtaining entry. In the natural history collections I found yet another *Megatherium* skeleton—not a very good one—and a considerable Pampean collection made by Santiago Roth, and fairly well exhibited; also the original *Andrias scheuchzeri*,¹ of which we ought to have a good photograph.

¹This is the specimen which old Jacob Scheuchzer described in very moving and pathetic terms as "*Homo diluvii testis*"—the remains of one of our antediluvian forebears, destroyed and buried by the Deluge. It is really a fossil giant salamander.

I spent two days at Basle, and got some idea of Dr. Stehlin's collection, which is one of the most important study collections in Europe, second only to Munich among those I have seen in its Tertiary mammals. It is very greatly improved from the old days. There is a magnificent collection from Quercy. . . . Then there is a very interesting series of collections from various horizons of later Oligocene and Miocene, and a Pliocene collection from Senèze that equals the Val d'Arno fauna or the Asti fauna in richness. Proboscideans are scarce, but all the smaller forms far better represented. Dr. Stehlin has already several fine skeletons mounted from this horizon—*Cervus*, *Machærodus*, etc. Among the antelopes is one quite near to *Oreamnus* (our mountain goat). This is certainly one of the great faunas, and it is fine to see it in such competent hands. . . .

From Basle I traveled to Geneva, where the old Pictet collection has slumbered for nearly half a century, but is now likely to be made the nucleus of an active center of work and of expansion if Dr. Revilliod stays there. He is one of Stehlin's pupils, a comparatively young man, full of enthusiasm for the development of the collection, and I hope he will accomplish a great deal. He is an authority on Chiroptera, the only man who knows much about the Tertiary genera.

A skull of *Elasmotherium* in the Geneva collection is interesting because the so-called horn base is very perfectly preserved, and there are five of the upper teeth on one side, two on the other. I do not think this is a real horn base. It is much more the type of a cal us-covered boss, and quite unlike the structure in any of the horn-bearing rhinoceroses. There is a considerable collection from the Pampean here, made by Santiago Roth (who was a Swiss by birth). I examined carefully all the mastodon material and casts in a vain search for the classic *Rhynchotherium* cast. One cast, curiously enough, had been labelled as from an original in Mexico City, but Dr. Revilliod had recently discovered that this was an error, and that it was from an original in Lyons, and of much later date than Falconer's time. It was equally obvious to me when I saw the cast that it was not from any American species of mastodon. The existence of this curious mislabelling leads me to suspect that the "*Rhynchotherium*" cast was once here but has disappeared and that its label has been transferred by accident to another cast. At all events it is not here now.

At Lyons, Professor Depéret was most cordial and friendly and spent all his spare minutes during the day and a half that I was at the university, in showing me his material and talking over interesting points. He has accumulated a magnificent collection, without doubt I should say the best Eocene collection in Europe. He has a fine, articulated, complete skeleton of the big *Palæotherium* from Morroiron. . . . There is also considerable good Oligocene and Miocene material and a fine

series from Senèze. . . . Altogether it is a very splendid collection and I wish I could spend a couple of months studying it.

I could give only half a day to the Lyons City Museum, and spent most of that in discussing with Dr. Gaillard his situation and researches. He also was most cordial and desired me to express his best wishes to President Osborn and to the American Museum, and to assure the president that the museum could count upon him for any photographs, measurements, or casts of specimens in his collection in which we are especially interested. He has many of the old types, especially from Grive St. Alban. . . .

At the Muséum de Paléontologie in Paris Dr. Boule received me very cordially and wished to be remembered to President Osborn in the most friendly terms.

Père Teilhard de Chardin is engaged at present upon a revision of the famous Cernaysian fauna. He is a very able scientist, keen, judicious, and very strongly interested in the fauna in question and its correlation with ours. He showed me all of the material, and there is much to confirm our provisional correlations. . . .

They have here a choice series of Eocene Primates, especially of small forms of skulls and complete dentitions, some new, others described from the Phosphorites, beautifully preserved, and the most *Tarsius*-like skull that I have seen. . . .

Boule showed me also his Chapelle-aux-Saints skeleton, and also two, male and female, from La Ferrassie, equally complete and important. The feet in both the Ferrassie skeletons are wonderfully fine. The male skull, originally much crushed, has been carefully taken apart and reconstructed. It is more complete than the Chapelle-aux-Saints; the teeth are present though worn to the roots. The reconstruction of the skull is a marvelously skillful piece of work. Boule said it took him and his assistants six years to complete it; in any event it is mighty well done. It duplicates the characters of the Chapelle-aux-Saints skull very exactly; so, too, those of the skeleton. These are partly figured in Boule's forthcoming book on fossil man¹. . . .

The mounted skeleton of *Mastodon angustidens* is incomplete as to the skull, and more or less of the skeleton is restored.

With Paris the series of letters from which I have been quoting comes to an end, and for the remainder of the trip I write from memory, as my notebooks contain details and figures but no general impressions.

The Natural History Museum of Brussels is especially noted for the unique series of Iguanodont skeletons—no less than twenty-eight of them, found at Bernissart near the French border. It has, however, other new and unusual features no less remarkable than these huge dinosaurs. The fossil vertebrates are all Belgian and arranged to illustrate the geological history of Belgium. The great hall, 300 x 100 feet, is divided into four stages, each representing a

distinct geologic epoch. The skeletons have been mounted without any plaster restoration, very skilfully and artistically; the cases are very handsome; locks and keys have been done away with; and the labels are recognized everywhere as a model of style for popular natural history. Professor Dollo, who has created this splendid exhibit in thirty years of active work, is still busied in improving and extending it. The German occupation during the war brought the activities of the museum practically to a standstill, but the collections did not suffer through any loss or neglect.

After two months on the continent, England seemed like home, and our confrères in London welcomed us not as visiting strangers but as old friends. The Natural History Museum in South Kensington still maintains the general arrangements of twenty or thirty years ago, but in every alcove one sees changes and improvements keeping it in touch with recent discoveries and ideas. The halls of fossil vertebrates comprise probably the most broadly representative collection in existence; every important fossil fauna from every country of the world is represented by collections more or less admirable. The finest features are the marine reptiles and the fossil proboscideans. The great extinct moas of New Zealand, the fossil mammals of Australia, and the ancient reptiles of South Africa, the classic fossils of the Siwalik hills of India, and the rare and tiny Jurassic mammals are other important items of this great collection.

Here, too, is the famous Piltdown skull, which I studied with due reverence, and discussed earnestly—and to me very profitably—with Dr. Smith Woodward and Professor Elliot Smith. I hope to give the results of this discussion in another article.

There is probably no other city in the world where so large a number of leading scientific men can meet together and exchange ideas in the various formal and informal gatherings of the scientific societies. Washington has much of this stimulating atmosphere, and so no doubt have Paris and Berlin and other great continental cities, but it was in London, for several reasons, that it impressed me most.

After spending nearly three weeks in London, mostly at the South Kensington Museum, I had but a few days for Cambridge and Oxford, where the natural history collections, admirably selected for university teaching, are complementary rather than comparable to the exhibition and the research development seen in the South Kensington Museum. It is the men and the atmosphere of culture and learning and of old-world dignity pervading the university life, that chiefly color one's recollections here. Our old friend Forster Cooper, the magnetic personality of Dr. Haddon, the brilliant and many-sided Sollas, the quiet thoroughness and insight of Professor Goodrich—these are the remembrances on which one would like to enlarge. But these random notes have already reached the limit of the space here allotted to them and upon these pleasant memories I must close.

¹These three skeletons are the most perfect specimens of the extinct Neanderthal man.

INSECTS AS FOOD

HOW THEY HAVE AUGMENTED THE FOOD SUPPLY OF MANKIND IN EARLY
AND RECENT TIMES

BY

J. BEQUAERT*

WHEN the turmoil of the World War threatened to imperil the food resources of civilized nations, the question of "substitutes" became a serious one, and, among other suggestions, experiments were urged by the eminent entomologist, Dr. L. O. Howard, to ascertain the food value of insects. Favorable as the results may have proved, one can well imagine the storm of protest that would have resulted had the adoption of such a program by the general public been advocated. Yet to many it is surprising and can be attributed only to prejudice, that civilized man of today shows such a decided aversion to including any six-legged creatures in his diet.

The ancient Greeks, so circumspect in all that pertained to their personal welfare, rated as a great delicacy the grasshoppers which, as we learn from one of Aristophanes' comedies, were brought by the Boeotians to the market place at Athens. In another of his plays the same author jocosely remarks: "Are locusts superior in flavor to thrushes? Why! do you want to fool me? Everybody knows that locusts taste much better!" And his compatriot, Alexis, mentions the locust among the provisions of a poor Athenian family:

"For our best and daintiest cheer,

Through the bright half of the year,
Is but acorns, onions, peas,
Ochros, lupines, radishes,
Vetches, wild pears nine and ten,
With a locust now and then."

The *Cossus* of the Greeks and Romans, so highly prized even at the tables of the rich, was the grub of a beetle living in the trunks of trees, perhaps that of the stag-beetle (*Lucanus cervus*). Pliny tells us that the epicures of his time considered

these insects on a par with the daintiest meats and even fed them on meal in order to fatten them and heighten their flavor.

Both the Old and the New Testament contain a number of allusions to insects as food, and among eastern peoples it is still customary so to regard them. In Leviticus, XI: 21-22, Moses describes four kinds of locusts which the Hebrews were permitted to eat: "Yet then may ye eat of all winged creeping things that go upon all four, which have legs above their feet, to leap withal upon the earth; even these of them ye may eat; the locust after its kind, and the bald locust after its kind, and the cricket after its kind, and the grasshopper after its kind." The locusts upon which St. John the Baptist (Mark, 1:6) lived in the desert have been the subject of much discussion, some authors seeing in them the fruit of the carob tree, while others maintain they were true Orthoptera and to prove this refer to the practice of the Arabs in Syria at the present day. "Those who deny that insects were the food of this holy man," says Hasselquist (*Travels*, p. 419) "urge that the locust is an unaccustomed and unnatural food; but they would soon be convinced to the contrary, if they would travel hither to Egypt, Arabia, or Syria, and take a meal with the Arabs. Roasted locusts are at this time eaten by the Arabs, in the proper season, when they can procure them; so that in all probability this dish was used in the time of St. John. Ancient customs are not here subject to many changes, and the victuals of St. John are not believed unnatural here; and I was assured by a judicious Greek priest that his Church had never taken the word in any other sense, and he even

*Assistant in Congo Zoölogy, American Museum.

laughed at the idea of its being a bird or a plant." In fact, locusts have been highly prized as food in the Orient from remotest antiquity, and Layard in his *Discoveries among the Ruins of Nineveh and Babylon* figures a sculptured Assyrian slab on which, among the attendants carrying fruit, flowers, and game to a banquet, several appear bearing dried locusts fastened to rods.

Nowadays the use of insects as a diet is practically restricted to wild or half-civilized peoples, but even so they form an important item in the food supply of mankind. Although many of those considered edible are too scarce to furnish more than an occasional dainty morsel, or because of their rarity are reserved for some special purpose, other kinds are gathered in great quantities, dried, and preserved for a time as part of the staple food supply of the tribe.

A common beetle of the Orient, *Blaps sulcata*, is put up in a preparation which the women of Egypt, Turkey, and Arabia consume for the purpose of acquiring a degree of plumpness corresponding with their notion of beauty. The large, fleshy grubs of certain wood-boring beetles—curculios, longicornes,

and the like—are greedily sought by many native tribes of tropical regions. Thus we are informed some planters in the West Indies used to keep negroes whose sole duty it was to go into the woods in quest of the large larvæ of *Prionus damicornis*, chiefly found in the plum and silk-cotton trees. These when opened, washed, and carefully broiled over a charcoal fire, were said to be tempting even to a jaded appetite. Ælian speaks of an Indian king who for dessert set before his Grecian guests, instead of the usual fruit, a roasted worm taken from a plant. This worm, he says, the Indians pronounced very delicious—a verdict confirmed by the privileged few who tasted it. In western Australia the decaying trunks of the grass tree house large colonies of a grub with a flavor very much like marrow, and these larvæ, either uncooked or roasted, form a favorite dish of the aborigines.

It is, perhaps, among African negroes that insects are most extensively used as food—a practice undoubtedly due more to necessity than choice. Owing to peculiar climatic conditions and the ravages made by animal diseases, but few goats, sheep, and cattle are kept



The "grub" or larva of the goliath beetle, one of the largest among the Coleoptera, lives in the swelling near the roots of the banana tree. Frequently it is five and one half inches long. It is said that when roasted on a stick this larva is a gastronomic treat among the natives of the African forest, as much for its tempting size as for its rare flavor. The specimen figured was obtained by Mr. Herbert Lang, leader of the American Museum Congo Expedition, at Medje, Belgian Congo

by the natives and these are too highly prized to enter very frequently into the diet, serving rather as signs of wealth; chickens and occasionally dogs are the only domestic animals freely eaten. The meat supply of the various tribes is, therefore, limited, necessarily consisting mainly of fish and game, the capture of which involves not a little trouble and is dependent on too many contingencies. To this scarcity is attributable the perpetual craving for animal food from which the black race has been suffering for centuries and which is undoubtedly to a large extent responsible for cannibalism. Although at least in the forest regions bananas, cassava, sweet potatoes, and corn offer a steady and regular sustenance obtained with comparatively little labor, in many other sections the soil is so poor or the drought so frequent and severe that the crops often fail. Considering that some of the most important products grown at present by the African blacks, such as cassava and corn, are of comparatively recent introduction, one cannot fail to see that formerly famine must have been a very frequent scourge. Is it strange, then, that the natives, facing starvation, tried to sustain life with whatever was handiest and so came to include insects in their regular diet?

From Doctor Livingstone comes the story that in the valley of the Quango River, Angola, the natives dig large, white larvæ out of the damp soil adjacent to the streams, and use them as a relish with their vegetable food. In many regions of South Africa where the produce is barely sufficient for the few scattered inhabitants, flights of locusts are looked on as such a blessing that the medicine man sometimes promises to bring them, instead of rain, by his incantations. Doctor Sparrman relates that the Hottentots rejoice greatly at the arrival of the locusts, about whose origin they have a most curious notion. They ascribe them to the good will of a mighty spirit a great distance to the north, who,



At certain seasons great numbers of these slender grasshoppers (*Homocoryphus*) are collected for their food value by the Logo of the northeastern Belgian Congo. Whole villages turn out into the surrounding savannah country to gather thousands of these insects by sweeping the high grass with fish nets

having removed the stone from the mouth of a certain deep pit, releases the locusts in order to furnish the tribe with food. The grateful natives collect and consume this provision so appreciatively that in the space of a few days they grow visibly fatter and appear in a much better state of health. It is the female insects principally that are eaten, especially just before their migratory flight, at a time when their wings are short and their bodies heavy and distended with eggs.

To Diodorus Siculus, who lived in the time of Julius Caesar, is due the credit for first describing the "Acridophagi" or locust eaters of Ethiopia, who, he says, are smaller than other men, of lean and meager bodies and exceedingly black. According to his account the south winds rise high in the spring and drive out of the desert an infinite number of locusts of an extraordinary size, furnished with very dirty, unsightly wings (probably the common migratory

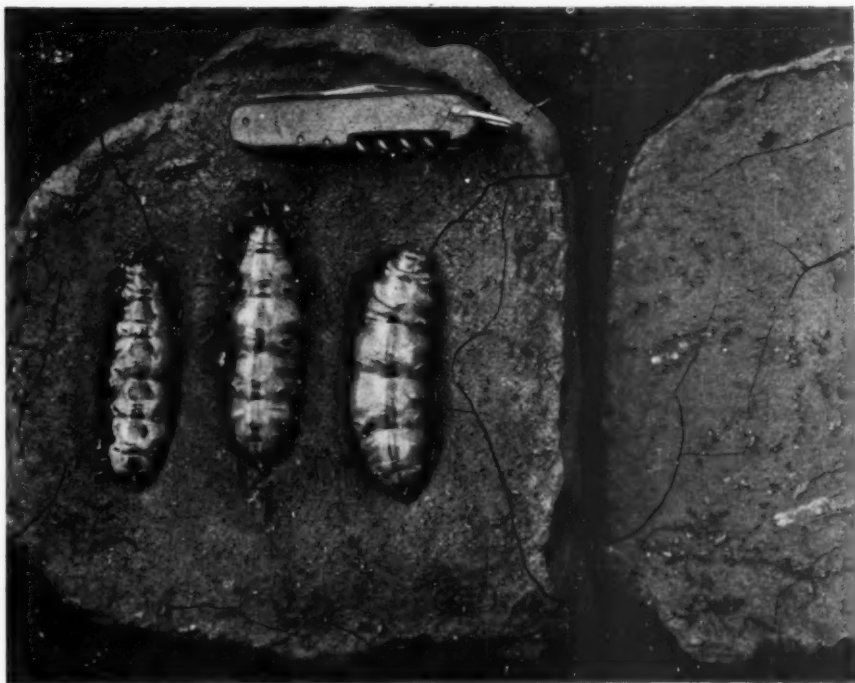


Photograph by H. Lang

In Africa termite nests often attain huge proportions, sometimes giving the landscape the effect of hill formation. This structure of *Termes natalensis* was photographed at Kwamouth, Belgian Congo. Built of clay carried up to the surface by worker termites, it was a labyrinth of galleries and chambers, which housed numberless tiny inhabitants. Although the outer walls of such termitaria are extremely hard, they are often demolished by the natives in search of these insects, which form a welcome addition to their diet

locust, *Pachytylus migratorius*). These locusts furnish a plentiful food supply. From information kindly given me by Mr. Herbert Lang, leader of the American Museum Congo Expedition, I

gather that in the northeastern corner of the Belgian Congo the Logo enjoy especially a grasshopper, apparently of the genus *Homocoryphus*, shown in the accompanying photograph.



Photograph by H. Lang

The royal chamber of *Termes natalensis* is located toward the center of the termite nest, often a foot or more below the surface of the earth. It is shared by one or more queens, huge, helpless creatures about three inches long. Niangara, Belgian Congo



Photograph by H. Lang

Termitarium of *Acanthotermes spiniger* at Stanleyville, Belgian Congo, showing how the natives envelop the structure in broad leaves to prevent the escape of the winged individuals. The cap of leaves over the top of the nest, and the side pocket from which the termites are scooped out by the natives, were removed before the photograph was taken

Throughout practically the whole of Africa termites or "white ants" are such an important addition to the regular diet of the natives that most travelers in their accounts comment upon the fact. So anxious are the Azande and Mangbetu of the Uele district to secure these so-called ants that termite hills are considered by them private property, and during the harvest of the insects, fights, often resulting fatally, occur between rival claimants. From Mr. Lang I learned also of an ingenious automatic device by means of which the natives of certain regions he visited collect the winged, sexual forms of the white ants at the season of their marriage flight. They tightly enfold the termite mound in several layers of the broad leaves of a marantaceous wood reed, the interstices soon being closed with earth by the termites, which usually join the inner leaves to the nest. A projecting pocket, built on one side of the leaf cover, serves as a trap, for when the winged termites begin to swarm, they find no egress and finally drop in masses into the pocket from which they are scooped out by the watching negroes. In other instances the nests themselves are dug up to obtain the workers, soldiers, and huge, fat queens, which form a dainty titbit when broiled over the fire. At Banalia along the Aruwimi River in December, 1913, I was rather surprised to find, among many strange articles of food offered for sale by the natives at the weekly market, baskets of dried soldier termites.

Junker, one of the first white men to reach the Azande country, relates how Chief Ndoruma sought to win his favor by sending him twenty large baskets of termites, each load so heavy that it was all a porter could carry. In this instance the contents made such an excellent oil that a chicken cooked in it tasted as delicious as if fried in butter.

Notwithstanding the odor of the formic acid, true ants, too, are frequently collected and eaten by natives of various

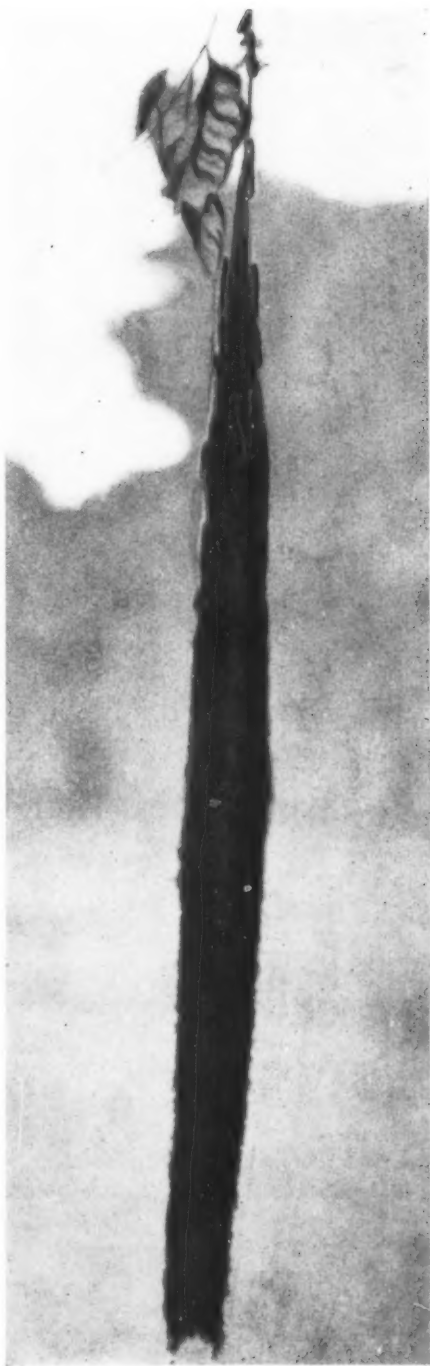
continents. According to Bingham, in Kanara and other parts of India, and throughout Burma and Siam, a paste of the green weaver ant (*Ecophylla smaragdina*) is served as a condiment with curry. Beccari records that the Dayaks of Borneo mix this ant with their rice, to which it lends a pungent, acetic flavor. Concerning the same insect, Saville Kent, in his fascinating *Naturalist in Australia* has this to say: "Beauty, in the case of the Green Ant, is more than skin-deep. Their attractive, almost sweetmeat-like translucency possibly invited the first essays at their consumption by the human species. Mashed up in water, after the manner of lemon squash, these ants form a pleasant acid drink which is held in high favor by the natives of North Queensland, and is even appreciated by many European palates."

It is generally known that certain American Indians are at times myrmecophagous. John Muir, in his *First Summer in the Sierra* tells how the Digger Indians of California eat the tickly acid gasters of the large jet-black carpenter ants. The Mexican Indians and those of our Southwest make a practise of eating the replete workers, or living honey-pots, of the celebrated honey ant (*Myrmecocystus*) and regard them as a delicacy with which to honor their guests. In some cases the insects are pressed and the honey thus extracted enjoyed with meals, in others they are put aside to ferment into a highly flavored wine. Certain African tribes collect the huge queens of *Carebara* at the time of their nuptial flight, when these ants emerge in large numbers from the termitaria in which their nests are concealed. In this case the gasters only are eaten, either uncooked or roasted, and are considered a great delicacy. Many of the South American Indians treat in a like manner the queens of the leaf-cutting ants (*Atta cephalotes* and *Atta sexdens*).

Caterpillars are often appreciated as

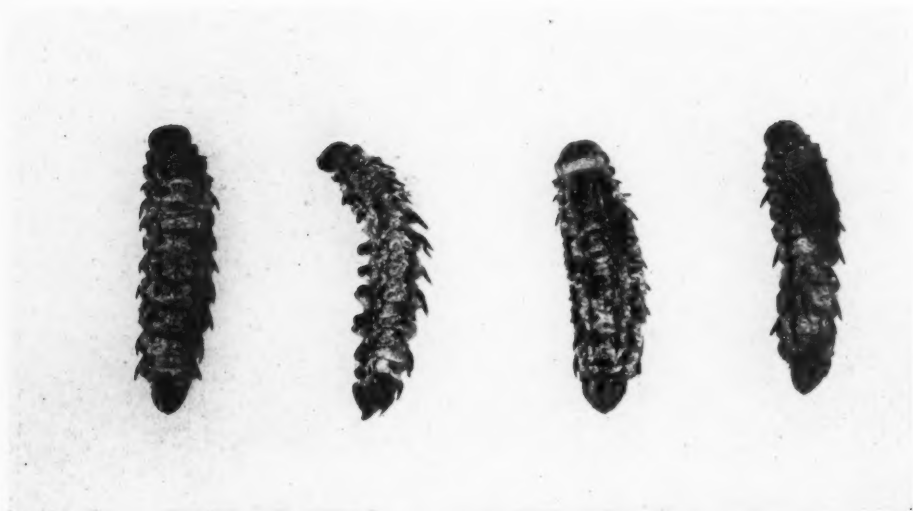
food in direct proportion to the ease with which large-sized species and those that occur in great numbers are collected. There appeared in the *Journal of the New York Entomological Society* for 1912 an interesting article by Mr. J. M. Aldrich regarding the use as food of the larvæ of a saturnid moth (*Colorado pandora*) by certain Indians of the Nevada-California border. Quite recently the same entomologist has published further notes on this strange Indian food, describing, among other points, the manner in which the caterpillars are collected from their food plant, the Jeffrey pine. Richard Schomburgh records how the Indians in British Guiana actively gather for culinary purposes a caterpillar and its pupæ which appear at the rainy season. Many African tribes, especially those of the forest country, consider these insects choice morsels. The Pangwe of southern Cameroon, according to Tessmann, eat no less than twenty-one different kinds. Not only do the natives distinguish by name a number of edible species, but they also know the particular food plants on which they are to be found. The caterpillars of the silk-weaving *Anaphe*, a genus of notodontid moths of equatorial Africa that have the peculiar habit of congregating when full-grown, sometimes to the number of a dozen or more, to spin a common silk nest in which they make their cocoon and pupate, are eaten and their silky nests offered for sale.

In mentioning that the *Anaphe* larvæ are relished by the natives of Gazaland, Swynnerton writes: "This is hardly of special interest in itself, for many other moth-larvæ are also eaten by them, but what is perhaps of some slight interest is their alleged differential effect on particular individuals eating them. I was first informed of this by a native skinner and collector in my employ, whose statements I have in general found to be reliable; and he specially remarked that even brothers, eating from the same dish larvæ that had been



Photograph by H. Lang

Communal silk cocoon made by caterpillars of a species of *Anaphe* in the Ituri Forest, at Medje, Belgian Congo. The larvæ of this and other members of the genus are eaten with great delight by many Central African tribes



Dried, and preserved, these *ebbo* caterpillars form part of the staple food supply of the Medje, who live in the Ituri Forest. When the heavy spines have been scraped off, the caterpillars, properly boiled and seasoned, are a dish of which the natives are exceedingly fond

captured and prepared together, differed thus in their reaction: one brother suffering no ill effects whatever, the other being always completely prostrated for as much as two or three days in the more serious cases. The statement has been completely corroborated by such natives as I have since spoken to on the subject. All have further agreed in saying that the larvæ are much liked, and that their inability to eat them is felt as a misfortune by those whom they affect unpleasantly."

In addition to the nests of *Anaphe*, the Medje diligently collect in the proper season various other caterpillars. Those called *ebbo* are especially sought; dried and smoked they can be preserved for many months. The most common species collected by Mr. Lang and reproduced here is evidently the larva of a ceratocampid moth of the genus *Micragone*, agreeing almost exactly with the description and figure given by Packard for *M. herilla*. Heavy spines cover the body but are scraped off before cooking. Two other species of caterpillars in the same collection also belong to the Ceratocampidæ. Another

delicacy among the Medje is the grub of a curious psychid moth (*Clania moddermanni*) which lives in a tightly woven bag of its own making covered on the outside with stalks and reaching a length of two and one half inches and a diameter of three quarters of an inch.

According to Tessmann, the Pangwe even hunt for the aquatic larvæ of dragon flies, to which they attribute diuretic properties. It is said that cicadas are a common article of food among the natives of Lower Siam, and the peculiar manner in which they are caught is in itself an interesting chapter as described by W. W. Skeat: "Two or three natives gather together at night round a brightly burning wood fire, one of them holding a lighted torch. The others clap their hands at regular intervals, and the Cicadæ, attracted by the noise and guided by the light, fly down and settle upon the people as they stand by the fire." In the region of Garamba, Belgian Congo, I am told, the natives not only eat the honey accumulated in the nests of wild bees, but even gather the larvæ and pupæ, which they roast over the fire before consum-



Photograph by H. Lang

This caterpillar of a psychid moth (*Clania moddermanni*) from the Ituri Forest, Belgian Congo, lives in a baglike house which it weaves of silk and covers with small sticks. The worm never leaves its envelop but has been removed here to be photographed

ing. Moreover, the nests of certain social wasps are also sought for the same purpose.

It is impossible to mention here more than a few of the many insects used for culinary purposes, for members of nearly all orders enter into the diet of one people or another. A few words may be added, however, about the two-winged insects, which are seldom used, probably because in most cases they are difficult to gather in great quantities. Williston

and Aldrich have called attention to the case of certain small flies of the genus *Ephydra*, the adults of which are found by the thousands along the shores of Mono Lake, California. In the latter part of the summer the puparia are washed up on the beach where they accumulate in heaps and can be collected by the bushel. In days gone by Indians came from far and near to gather them for food and a few still continue to do so. The worms are

dried in the sun and the shell is rubbed off by hand. A yellowish kernel remains, very similar to a small grain of rice. This is oily, very nutritious, and under the name *koo-chah-bee* or *koo-tsabe* used to form a very important item of food. Its flavor is described as not altogether unpleasant and according to an informant: "If one were ignorant of its origin, it would make nice soup. It tastes more like patent 'meat biscuit' than anything else I can compare it with." There are also a few instances recorded of the adult flies themselves having been eaten. A lepid fly of the genus *Atherix* at certain seasons appears in astonishing numbers along brooks in northeastern California. Trees, bushes, and rocks are covered with them to a depth of five or six inches. The Indians scrape them off and collect them in great heaps, cooking them between hot stones in an oven-like pit. The resulting reddish brown mass of about the consistency of headcheese, is made into loaves like bread, and can be counted on as a mainstay during the winter.

On some of the Central African lakes in the dry season a minute midge, one of the Chironomidae, rises from the water in clouds so dense that from a distance the effect is that of smoke. Near Lake Nyasa the midges are known as *kungu* and round out the larder of many of the shore tribes. When great hosts of them are driven landward by the wind, they are swept off the bushes and rocks by the natives or caught against mats hung up for the purpose; they are then compressed into oily cakes, roasted, and eaten. According to Koch, the Sesse Islanders collect and prepare in a similar manner the may flies which swarm in dense columns over Lake Victoria.

In spite of the weight of evidence from the historical point of view, it is not the purpose of the present article to furnish arguments regarding the value of insects as food or for including them in our own diet. What we eat and what we do not eat is, after all, more a matter of custom

and fashion than anything else. Many years ago a learned French physician, J. J. Virey, made an exhaustive study of the question "Whether man *may* eat insects and whether he *should* eat them," with this conclusion: "Man may eat insects: nothing in his anatomical organization or his physiological functions is opposed to it. He should eat insects: in the first place, because his cousins the monkeys and his ancestors the bats, or to be brief the primates, eat them; in the second place, because insectivorous animals are superior to the other species of their order, as well in their more perfect organization as in the superiority of their intelligence." Still, it must be admitted that this line of reasoning will have but slight appeal to the average white man. In my opinion the habitual consumption of insects may not be without danger. The greater number of them have such a heavy, indigestible skeleton of chitin that their continued use might well lead to dyspepsia. In addition, the small size of most of them makes it impossible to eliminate from their bodies all organs in which the waste products are accumulated, and which, because of their recognized poisonous properties, are as a rule carefully removed in the case of our meat and fish.

Be this as it may, those inclined toward reforming our food habits may be interested in a booklet published by Vincent M. Holt under the title *Why not eat insects?* They will find there an array of recipes for the preparation of various insects and also a number of menus for entomophagous dinners. If the time ever comes when insects are universally used as food, Mr. Holt's book will undoubtedly be greatly treasured by all gastronomes. Perhaps some day he may be regarded as one of the benefactors of humanity, for did not Brillat-Savarin write: "He who invents a new dish does more for the happiness of his fellowmen than all the philosophers, writers, scientists, and politicians together."

NOTES

A RESOLUTION was unanimously adopted by the Executive Committee of the American Museum, electing Mrs. Olivia Sage, Mr. A. D. Juilliard, and Mrs. Helen C. Juilliard, benefactors, in recognition of their generous bequests to the Permanent Endowment Fund.

SINCE the last issue of NATURAL HISTORY the following persons have been elected members of the American Museum:

Honorary Fellow: MADAME MARIE SKLODOWSKA CURIE.

Life Members: MESSRS. F. WILLIAM GERTZEN, WALTER ALFRED HAFNER, O'DONNELL ISELIN, A. VAN HORNE STUYVESANT, JR., H. N. THURSTON, AND HUGO WEIGERT.

Sustaining Members: MESSRS. EUGENE S. LA BAR AND ISRAEL UNTERBERG.

Annual Members: MESDAMES JOHN LEE CONNABLE, E. F. DWIGHT, IRVING R. FISHER, JOSEPH ADDISON GOETZ, LUCY W. HEWITT, R. G. MCGREGOR, CHARLES MINER, RICHARD O'GORMAN, ARTHUR W. PAGE, CHARLES G. PETERS, GEORGE TAYLOR, JOHN H. THOMAS; THE MISSES ALMA LISSBERGER, G. LUNDQUIST, LOUISE E. VON BERNUTH; DR. FREDERICK TILNEY; THE REV. F. S. IDLEMAN; MESSRS. GEORGE W. ALGER, COPLEY AMORY, THORNTON W. BURGESS, HAROLD T. CLARK, HARRY COLLINS, CYRUS S. EATON, HOWELL FISHER, ARTHUR G. FRÉY, GEORGE WILBERT GRANDIN, WALTER T. HATHAWAY, WARREN S. HAYDEN, LOUIS JERSAWIT, M. F. LOEWENSTEIN, CHARLES CAPRON MARSH, GEORGE T. MAXWELL, JOSH. W. MAYER, ROBERT H. MONTGOMERY, JOHN BALLANTINE NIVEN, D. RAYMOND NOYES, GEORGE S. OLDS, MARTIN PLESS, H. A. POMROY, HENRY H. REED, VICTOR F. RIDDER, RICHARD P. ROBISON, GEO. M. ROGERS, ARMAND SCHMOLL, L. E. SCHWAB, PHILIPIN SCHWARZ, JOSEPH H. SEAMAN, RICHARD SECKELS, GEORGE A. SELIGMANN, CARL SHAFF, FRANK G. SHATTUCK, HERBERT PRESCOTT SHREEVE, JOSHUA SILVERSTEIN, W. W. SKIDDY, THOMAS W. SLOCUM, HENRY G. SMITH, STANLEY SMITH, JOSEPH SPECTOR, EMIL STERN, ISAAC E. STERNBERG, JULES P. STORM, RAYMOND E. STREIT, CHARLES WILLIAM TAUSSIG, HERBERT C. TAYLOR, HERBERT L. THOWLESS, WALLIS S. TURNER, GEORGE B. VEIT, GEORGE WATHEN, ALEX. WEINBERG, C. H. WILCOX, ERNEST J. WILE, IRWIN WILE, OSCAR J. WILE, MATTHEW A. WILKS, SIGMUND WIMELBACHER, W. E. WINCHESTER, AND GEORGE M. YORKE.

Associate Members: MRS. B. C. MADEIRA; THE MISSES JEAN H. HART, KATHLEEN MARGUERITE

HEMPEL; DOCTORS F. A. DRAKE, BERNAYS KENNEDY, ERNEST C. LEVY, L. B. MANCHESTER, ARNOLD PESKIND, F. X. POMAINVILLE, CHARLES RAYEVSKY, RUSSELL RICHARDSON, DAVID RIESMAN, WILLIAM J. ROSS, G. C. SABICHI, FLORENCE R. SABIN, ADOLPH SACHS, JOSEPH SAILER, EDWARD C. SHERMAN, D. LAURENCE SMITH, HARRY A. SPANGLER, COLIN C. STEWART, GEORGE A. STILL, CARL G. SWENSON, ALFRED H. TICKELL, A. E. TURMAN, J. VAN DER LAAN, RALPH W. WEBSTER, LEWIS H. WEED, HARRY M. WEGEFORTH, JOSEPH D. WEIS, WANDA WENIGER, WM. B. WHERRY, HENRY A. WHITING, WILLIS R. WHITNEY, OTIS B. WIGHT, ERNEST L. WILLETT, J. PEARSON WILLITS; MAJOR HENRY J. NICHOLS, M. C. U. S. A.; THE REV. WALLACE ROGERS; PROFESSORS A. R. SAWYER, DAVID H. TENNENT; MESSRS. F. W. ADAMS, NATHAN A. BOWERS, P. BURNS, D. S. CULVER, OTTO DEGENER, ELWYN H. DOLE, HARRY C. DUDLEY, JOHN W. FULTON, J. W. LYTLE, W. C. MATTHEWS, W. R. MORRIS, LESLIE W. NEWBERRY, CHARLES P. NOYES, PRESCOTT OAKES, ANDREW J. O'REILLY, STANLEY PARTRIDGE, J. F. MAX PATITZ, W. E. PEASE, WIN PROEBSTEL, BUELL H. QUAIN, IVAR L. SJÖSTRÖM, HARRISON STIDHAM, JULIUS F. STONE, EDWARD B. TAYLOR, C. H. THOMAS, H. S. TULLOCK, SAMUEL TOBIAS WAGNER, EDWARD H. WALDO, B. C. WOLVERTON, SAMUEL S. WYER; THE SWARTHMORE COLLEGE LIBRARY; AND THE DEPARTMENT OF MINING GEOLOGY, SCHOOL OF MINES, UNIVERSITY OF PITTSBURGH.

"THE Evolution, Phylogeny, and Classification of the Proboscidea," was the subject of an address delivered by President Henry Fairfield Osborn, of the American Museum, at the annual meeting of the National Academy of Sciences, held in Washington, D. C., on April 25-27. The address was illustrated by lantern slides.

PROF. HENRY E. CRAMPTON, honorary curator of lower invertebrates in the American Museum, recently returned from his third tour in the Polynesian Islands. Through his industrious collecting the Museum is enriched by a large number of specimens representative of the fauna of the Mariana Islands, Manila, China, Siam, the Malay Peninsula, the Dutch East Indies, and Australia.

He reports (April 8, 1921) that of snails of the genus *Partula* he was able to secure, for purposes of research, upward of 10,000 specimens from more than forty localities in Guam and Saipan of the Mariana Islands.

Herpetological material, collected by Doctor Crampton at various places, consisted of thirty-four lizards, snakes, and frogs, in twenty-two

vials and bottles. In addition to these he brought back with him three bottles containing five snakes, which were presented to the American Museum by Lieut. Gen. E. W. Trotter, adviser to the King on military affairs, Bangkok, Siam.

Three thousand dried insect specimens of the orders Lepidoptera, Coleoptera, Odonata, Hymenoptera, etc., and thirty-five vials containing ants and other insects, as well as spiders, preserved in alcohol, were delivered to the department of entomology.

For the department of lower invertebrates Doctor Crampton secured sixty vials of Myriapods, miscellaneous land shells, worms, and Isopods. In addition he brought back numerous marine shells, which have not yet been definitely estimated.

Certain items of ethnological interest were obtained for the department of anthropology. Doctor Crampton was able, also, to make preliminary arrangements for the purchase by this department of a complete and classified series of baskets from the northern Siamese territory occupied by the Lao people.

A few geological specimens from Australia were secured for the department of geology.

Nearly four hundred and fifty photographs, some of which are used as illustrations for the article in the present issue entitled, "A Journey to the Mariana Islands—Guam and Saipan," were taken by Dr. Crampton, and in addition there were purchased a representative series of photographs in the Philippine Islands, in Siam, in Java, and in Australia.

DR. FRANK M. CHAPMAN, curator of ornithology in the American Museum, recently returned from a trip to England made for the purpose of studying the types of Ecuador birds in the British Museum, work which is a preliminary part of his studies for the second volume of the faunal monographs on the South American birds. The volume relating to Ecuador will be of the same nature as the Columbian book published in 1917. In addition to his study of specimens in the British Museum and the Zoölogical Museum at Tring, Doctor Chapman arranged, while abroad, an important exchange of ornithological specimens.

PRESIDENT HENRY FAIRFIELD OSBORN and Mr. George N. Pindar, of the American Museum, who are respectively chairman and secretary of the New York State Roosevelt Memorial Commission, attended a meeting of that organization held in Albany on March 31. Among the proposals considered was that the memorial take the form of a building for the American Museum, to be known as the Roosevelt Memorial Hall.

DR. L. C. SANFORD, who some weeks ago was elected to the Board of Trustees of the American

Museum, has quite recovered from his recent illness and is once again in close touch with the work of the department of ornithology and of the Whitney South Sea Expedition, of which he is chairman.

DR. CHARLES-EDWARD A. WINSLOW, curator of public health in the American Museum, and professor of public health in Yale University, is still in Europe, discharging his important duties as general medical director of the League of Red Cross Societies. Dr. Winslow writes that in Poland things are progressing well and that the antityphus work in particular, which he went to inspect as a representative of the League of Nations, is being handled with remarkable efficiency.

Notwithstanding his heavy responsibilities in connection with the work of the Red Cross, Dr. Winslow has been visiting certain of the European museums. On page 101 of the January-February issue of NATURAL HISTORY, his impressions are given of the different museums in London having health exhibits. In a more recent letter he comments upon the Natural History Museum of Vienna, to which Dr. W. D. Matthews gives extended consideration on page 188 of the present issue. The collections of that museum impressed Dr. Winslow as being very tastefully arranged, effective use being made of dark backgrounds. "At the Natural History Museum and everywhere else," he writes, "I heard tales of desperate privations." He adds that the situation in Vienna seems almost hopeless and that he is "deeply impressed with the need for making every possible effort to save the rich and artistic culture of that city from destruction."

DR. ROBERT CUSHMAN MURPHY, associate curator of marine birds, American Museum, has been delivering lectures before a number of different institutions and societies in the United States and Canada. On March 12 he addressed an audience of 3600 in Boston; on March 19 he spoke in Chicago, and on March 26 again in Boston. His addresses have been chiefly on the Peruvian guano industry and bird conservation in South America. On April 16 Dr. Murphy lectured at the University of Toronto regarding "Explorations among the Islands of Peru." On April 21 he delivered an address in Philadelphia at the opening session of the convention of the American Philosophical Society, on "The Influence of the Humboldt Current on the Distribution and Abundance of Marine Life."

MR. LOUIS R. SULLIVAN, assistant curator of physical anthropology in the American Museum, who has been making a study of mixed-blood children and adults in the Hawaiian Islands, has been asked by the Bishop Museum of Hono-

lulu to act as joint representative of that institution and of the American Museum in presenting the results of their coöperative work to the Second International Congress of Eugenics that will be held in New York in September of this year. The Hawaiian Islands—a meeting ground of East and West—constitute a laboratory for the study of the amalgamation of different races and the resulting physical and mental characteristics. The data which Mr. Sullivan has gathered during his sojourn in the Islands should prove of distinct value to the congress.

THE Heckscher Museum, at Huntington, Long Island, which was opened to the public last summer, is nearing the completion of its installations. While primarily a museum of fine arts, containing a number of exceedingly valuable canvases, it will house also several choice collections of minerals and of archaeological objects. Mr. N. C. Nelson, associate curator of North American archaeology in the American Museum, has just completed the installation of the archaeological material, which at present consists of a fine series of specimens from Long Island and another equally fine series from Egypt. The Egyptian exhibit includes Palæolithic, Neolithic, and Post-Neolithic types of flint implements, and is the pick of a large collection made a number of years ago by Robert de Rustafjaell. The remainder of this collection, for which there was no room at Huntington, was generously given to the American Museum some months ago. The builder and patron of the museum at Huntington is Mr. August Heckscher, of New York City.

THE hall of prehistoric man, which is to replace the old general archaeology hall in the southwest pavilion on the second floor of the American Museum, is slowly taking shape. To make the place more attractive, Mr. Albert Operti, of the Museum staff, has been engaged for several weeks in the reproduction of some of the famous palæolithic cave paintings of western Europe, several of which are already in place on the walls.

Formerly the hall was devoted entirely to the archaeology of North America north of Mexico—exclusive of the Pueblo and Eskimo culture areas. This exhibit was arranged by states, and as such was very useful for the student of comparative archaeology. A somewhat similar but much condensed exhibit will remain in the new hall, one half of which, however, is to be devoted to the archaeology of the Old World. The remaining half of the hall will be divided between the two portions of the New World. In other words, the old exhibit will be reduced by about three fourths, and the new hall is to show in succinct form the complexion of human culture throughout the prehistoric world. The main idea underlying the whole exhibition

scheme is to be evolution or development. To demonstrate this fact of development, the material will be arranged as far as possible on a chronological basis.

The demonstration of cultural evolution is to be reinforced in the adjoining tower room by an exhibit showing the physical development of man. This will include casts and restorations of all the remarkable skeletal finds of ancient date, as well as reproductions showing the surviving racial types. Some of this material is already in place.

THE old saying, "There is nothing new under the sun," may apply in human history and life but certainly does not apply in many branches of science, perhaps least of all in palæontology. In the year 1913 a gigantic and wholly unexpected type of mammal turned up in southwest India and was named *Baluchitherium osborni* by its discoverer, C. Forster Cooper, who is now head of the University Museum of Zoölogy in Cambridge, England. The relationships of this animal were as mysterious as its size was astonishing. Little clew was afforded by the parts preserved except that the ankle bone was that of an odd-toed ungulate and that a portion of the tooth remotely resembled that of a rhinoceros. The second vertebra of the neck was found by Mr. Cooper to be totally different from that of the rhinoceros, and indicated an animal with a very long neck rather like that of the horse, but even longer; the vertebra itself, however, was not horselike. The same animal has now turned up in Turkestan, and the Russian palæontologist Borissyak, has described it under the name *Indricotherium* quite independently of the description of Cooper. Borissyak's published account, curiously enough, is almost the same as Cooper's in extent, and although his paper will diminish the novelty of Cooper's material, it is not less important and interesting. Cooper is now preparing to publish a separate account, rather fully illustrated, in which will appear a translation of Borissyak's paper. The Russian palæontologist agrees with the Cambridge savant in noting a tendency to monodactylism—that is, concentration of the weight of the body on one digit, with a consequent analogy in the wrist toward that of the horse, while it still retains the rhinoceros features in part.

WORK on Volume III of Dr. Bashford Dean's *Bibliography of Fishes* is making good progress. All the various addenda to this volume, which has been extended and edited by Dr. E. W. Gudger and indexed by Mr. Arthur Henn, of the department of ichthyology of the American Museum, are completed, and but for the printers' strike at Cambridge, the University Press more than a month ago would have printed the first 338 pages. Doctor Gudger, Mr. Henn, and Miss

Francesca La Monte are all at work on the index. A good part of this has been completed and is in galley proof.

A companion undertaking to the *Bibliography of Fishes* is a *Bibliography of Arms and Armor*, which Dr. Bashford Dean is planning and which will be issued by the Metropolitan Museum of Art.

MR. H. E. ANTHONY, associate curator of mammals of the Western Hemisphere in the American Museum, and Mr. Herbert Lang, assistant curator of African mammals in the same institution, attended the third annual meeting of the American Society of Mammalogists, which was held at Washington, D. C., on May 2, 3, and 4. On the afternoon of the second day of the meeting Mr. Lang delivered an illustrated address entitled "Life Histories of African Squirrels and Related Groups." On the morning of the third day Mr. Anthony spoke on "Life Zones of Southern Ecuador," accompanying his address with lantern slides. At the business meeting Mr. Anthony was elected a director of the society.

Dr. E. W. GUDGER, associate in ichthyology, American Museum, recently gave a lecture before the Biology Club of Princeton University on "The Structures and Habits of Some of the Sharks of Southern Florida."

VISITORS to the American Museum are invariably impressed by the remarkable picture of the "Total Eclipse of the Sun as Seen in Baker, Oregon, June, 8, 1918," which was painted by Mr. Howard Russell Butler and presented to the Museum by Mr. Edward D. Adams. This painting has recently been revarnished and retouched so as to enhance the brilliancy of the prominences and of the corona.

The same artist has deposited with the Museum for six months his "Northern Lights, Maine Coast, August, 1919." The picture has been placed in the room on the first floor that has been set apart for Mr. Butler's paintings. "Northern Lights" was given the place of honor in the center of the north wall of Vanderbilt Gallery at the National Academy of Design during the winter exhibit, 1919.

The aurora of August 11, 1919, was perhaps the finest for color and brilliancy ever seen in the vicinity of Ogunquit, Maine. It occurred on the night of the full moon.

"I have painted Bald Head Cliff, which appears in the picture, in moonlight several times," writes Mr. Butler. "One of these won the Carnegie Prize in 1916. I was at work on still another on the night of August 11. The Cliff was to the north of my view point. I had just finished my sketch of the Cliff when (about quarter to ten) this wonderful display suddenly appeared, flooding the heavens with light.

Vertical shafts soon rose near the horizon in almost every direction and reached to the zenith, where they united in a complicated weaving. The view northward over the Cliff was particularly fine. Arches appeared from which additional shafts ascended. The colors varied from pale greens to rose. The intense illumination lasted for about twenty minutes.

"I was most fortunate in being in such an excellent position for observation and in having my sketching materials with me; also in having my foreground already completed.

"I was working on dark gray paper with black and white, with no light but that of the moon and the aurora itself. While this enabled me to record the values—lights and shades—for colors I had to rely on formulas, as when painting the eclipse. The following day I painted a first picture on which the final picture is based.

"Prof. Frederick Ehrenfeld, of the University of Pennsylvania, was on the Cliff and wrote an article describing this aurora, which appeared in *Science*, August 22, 1919. He did not know of my picture and I did not know of his article till long afterwards."

In addition to its astronomical pictures the American Museum is fortunate in possessing eight paintings of Mt. Pelé of Martinique during the great eruptions of 1902-3, which are excellent examples of the skill of the painter—the famous geographer and intrepid explorer—Angelo Heilprin, of Philadelphia. Some of the sketches for these paintings were made by Professor Heilprin at the imminent risk of his life, for they were done at close range, while the volcano was in action.

Perhaps the most beautiful of them all is that of the Tower of Pelé, showing that remarkable feature at almost the extreme of its development. Professor Heilprin's reputation rests upon his work as a scientist but these paintings, from their delicacy of touch, accuracy of drawing, and feeling for color, reveal him as an artist of talent. Professor Heilprin died in 1907 and the paintings came to the Museum as a memorial gift from his family.

In the Academy Room is a beautiful painting of Mt. Pelé, as it was in March, 1903, at the time of the greatest development of the new cone, which was built up within the crater by the eruptive activity of 1902-3. The spine, which is so prominent in this painting, was the feature left by continued explosions, as the lava welled up from the conduit.

The painting was made by Mr. Charles R. Knight, after photographs taken by Dr. E. O. Hovey, when on an expedition sent by the American Museum for the purpose of studying the phenomena of the great eruptions on the islands of Martinique and St. Vincent, 1902-3.

For purposes of comparison, it would be very desirable to secure a painting showing Mt. Pelé



Courtesy of the American Federation of Arts

NORTHERN LIGHTS, MAINE COAST, AUGUST, 1919
A painting by Howard Russell Butler

as it is now, with the famous spine gone and with the slopes of the mountain partly restored to their former beauty by the advancing tropical vegetation.

In connection with the article (p. 101 of this issue) on "Insects as Food" by Dr. Joseph Bequaert, assistant in Congo zoölogy in the American Museum, the reader will recall that J. Henri Fabre, whose zeal for science sometimes led him to make quaint experiments, once sampled a dish of cicada nymphs. Aristotle had been quoted as extolling their delicious taste and Fabre wanted to see how well justified were his praises. Accompanied by his family he set forth to scour the region about his dwelling. Two hours' search yielded but four nymphs—sufficient, however, to determine whether the dish deserved to be revived for the benefit of the modern epicure. The insects were cooked according to the simplest recipe lest too elaborate preparation spoil their flavor: "a few drops of oil, a pinch of salt, a little onion, and that is all." Everyone had a taste of the titbit, but instead of the toothsome delicacy promised, Fabre and his family found the insects "tough as the devil and anything but succulent."

The experiments of Fabre are paralleled in this country by those of Prof. Charles V. Riley and Dr. L. O. Howard, who in the eighties tested the palatability of the periodical cicada or seventeen-year locust. This insect seemed to give promise of an abundant, even if intermittent, addition to our food supply. A stew was prepared to which the cicada contributed "a distinct and not unpleasant flavor" but the insects themselves were reduced in the process to bits of flabby skin and were not at all palatable. Fried in butter, they remind one, it is said, of shrimps but, adds the account in the *Proceedings of the Entomological Society of Washington* for 1885, "They will never prove a delicacy." In this conclusion the average individual will doubtless concur without feeling impelled to put his conviction to the test. Yet it should be remarked that the Indians ate cicada both before and after the coming of the white man, and that the inherent repulsion which most of us feel toward sampling such an insect is hard to reconcile with our partiality for a scavenger like the lobster, which belongs to the same subkingdom as the insects, or for the ooze-reared oyster, their remoter cousin.

THROUGH the voluntary assistance of several members of the staff, the American Museum has been able to cooperate with the American Red Cross in conducting a recreational and educational experiment this spring at the United States Public Health Hospital at Fox Hills, Staten Island.

Between eleven and twelve hundred men,

whose disabilities have been caused directly or indirectly by their services during the Great War, are receiving treatment at the Fox Hills Hospital and the problem of their entertainment is a difficult one. The suggestion that the Museum lecturers attempt its solution was first made in February by Mr. Ralph W. Hees, the Special Representative for Civilian Relief of the Atlantic Division of the Red Cross, who considered it advisable to modify the usual program of vaudeville and motion pictures by introducing something of an instructive nature. Although some doubt was expressed as to the success of Mr. Hees' plan, the cooperation of several members of the Museum staff was secured for a course of five weekly lectures. Dr. G. Clyde Fisher opened the series on March 16 with the motion picture lecture, "How Life Begins."

Effective posters and cartoons were drawn at the Hospital and used to advertise the lectures with the result that five hundred patients, in hospital robes and in uniforms, on crutches and in wheel chairs, came out to hear Doctor Fisher. Attendance has varied at the different lectures, but the representatives from the Museum have always been well received by an audience which would not hesitate to express its real feelings. When the degree of mental receptivity, the restlessness and despondency of these men are taken into consideration, the experiment appears surprisingly successful. The members of the staff who have assisted Mr. Hees in this undertaking are Dr. G. Clyde Fisher, Mr. James P. Chapin, who gave his lecture, "In Central Africa," Miss Ruth E. Crosby, who talked on "Hiawatha," Dr. Robert C. Murphy, discussing "Sea Elephants and Penguins of South Georgia," Mr. George H. Sherwood, who described "Neighbors of the Sea and Land," and Mr. Carl E. Akeley, who entertained the boys with tales of "Roosevelt's Africa." All of these lectures were made graphic by the use of slides and motion pictures.

In connection with the Second International Congress of Eugenics, a eugenics exhibition will be held September 22 to October 22, in the forestry hall of the American Museum of Natural History. Charts, maps, pictures, models, and scientific apparatus are considered proper means for displaying and demonstrating eugenical facts and principles, but any other kind of display material which any particular exhibitor desires to offer will be most carefully considered. The exhibits should be of such a nature that the man of ordinary intelligence and education, but without special scientific training, may readily comprehend and appreciate them.

All exhibits should be started in time to reach the American Museum on or before July 15, 1921. They are to be labeled: Dr. H. H. Laughlin, Eugenics Congress, American Museum of Natural History, New York City.

WHEN NATURAL HISTORY was considering the replacement of its former cover by a new one, it suggested to the authorities at the Washington Irving High School, 40 Irving Place, New York City, the desirability of having a contest among the students in the industrial art division of that school. The demonstrated ability of these art students gave assurance that an unusually attractive series of cover designs would be forthcoming. A first prize, a second prize, and seven general prizes were offered. The school took up the suggestion with enthusiasm and the splendid series of sixty-two designs that were submitted for adjudication justified the highest hopes that NATURAL HISTORY had entertained. The competition revealed not only talent of a high degree but unusual skill in treating decoratively natural subjects without sacrifice of, on the contrary with emphasis upon, their essential character.

Three classes—those of the Misses Marie E. Gurnee, Florence Newcomb, and Bertha S. Shepard—participated in this contest, under the general direction of Mrs. Samuel T. R. Cheney, chairman of the art department of Washington Irving High School. The ages of the girls taking part in this contest ranged from fifteen to eighteen years.

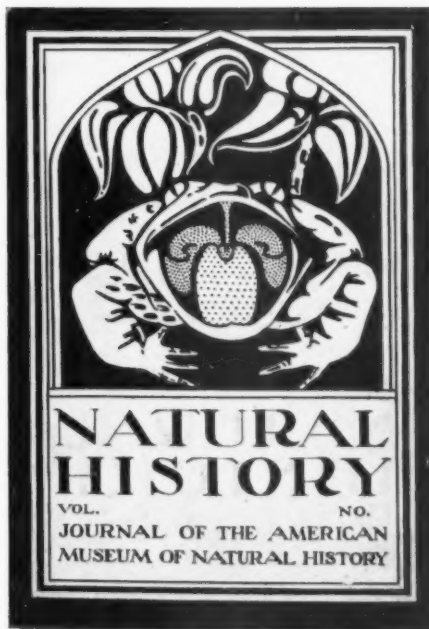
Certain recommendations or guiding principles were adopted: the designs, including figures, were to be relevant to the title, NATURAL HISTORY; a specified wording was to appear on the cover; the stock for the cover might be any color but must be readily obtainable in the market. Preference was expressed for one color ink but provision was made for an additional color if the artist found it desirable. Above all things the designers were urged to express their own ideas.

A number of visits were made by the contestants to the Museum, independently as well as under the supervision of their teachers, for the purpose of studying subject and composition, of correcting the drawings made in the class room, and of adding the necessary details.

The full series of designs has been placed on exhibition in the hall of forestry, on the ground floor of the Museum.

FOR the third successive time an ornithologist has been awarded the Daniel Giraud Elliot Gold Medal. The two earlier recipients of this distinction, which is bestowed upon the author of such paper, essay, or other work on some branch of zoölogy or palæontology published during the year, as is in the opinion of the judges most meritorious and worthy of honor, were Dr. Frank M. Chapman for his "Distribution of Bird-Life in Columbia," which appeared in 1917, and Dr. William Beebe, for the first volume of his "Monograph of Pheasants," published in 1918.

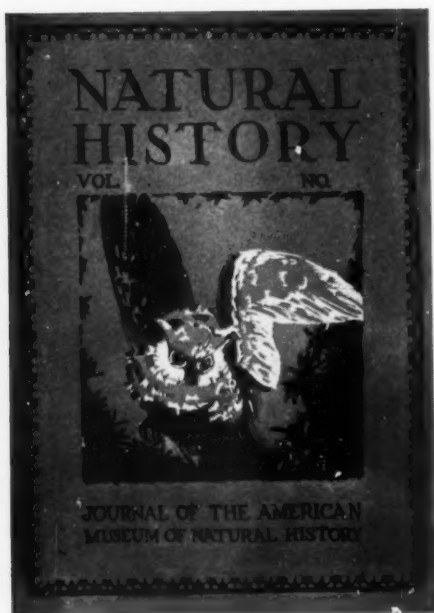
The present recipient is Mr. Robert Ridgway, curator of the Division of Birds in the United



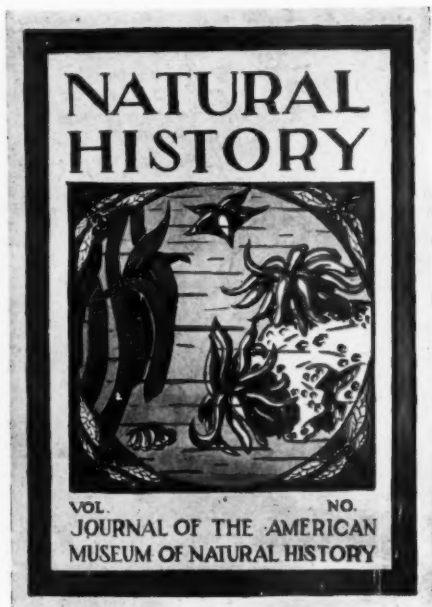
To this cover design by Bertha N. Jaffe was awarded the first prize in the competition recently instituted by NATURAL HISTORY. Other prize winning designs are shown on the two pages following

States National Museum, and the award is made in recognition of the eighth volume of *The Birds of Middle and North America*, which appeared in 1919. This monumental work, which will be complete in ten volumes, already totals 6800 pages, defines nearly 900 genera, and describes more than 3000 species and subspecies. Professor Henry Fairfield Osborn, in his address as chairman of the Elliot Medal Committee, referred to Mr. Ridgway's work as one which "in method, comprehensiveness, and accuracy, as well as in volume, has never been surpassed in the annals of ornithology."

ON April 9 there gathered at the American Museum the representatives of three societies—the American Association for the Advancement of Science, the National Academy of Sciences, and the National Research Council. The purpose of the meeting was to form a joint committee on conservation. One of the aims will be to educate the public to the importance of safeguarding our resources, in many cases already depleted too greatly by their prodigal use in the past. All natural resources—forests, coal, oil, fisheries, and wild animals—will claim the attention of the committee. Preliminary steps to effect organization were taken and methods discussed for the raising of the necessary funds.



By
Frances Gessner



By
Florence Breiner



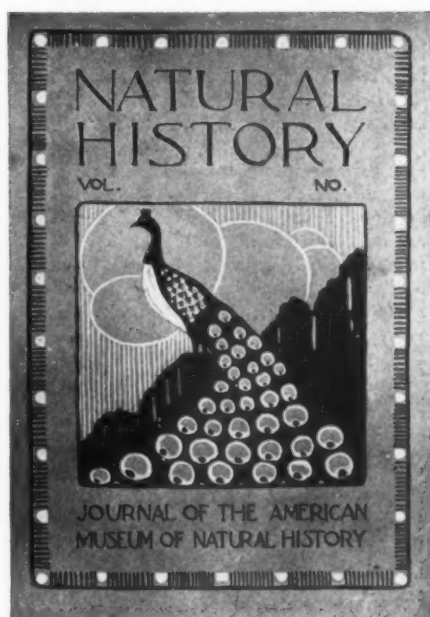
By
E. De Takacs



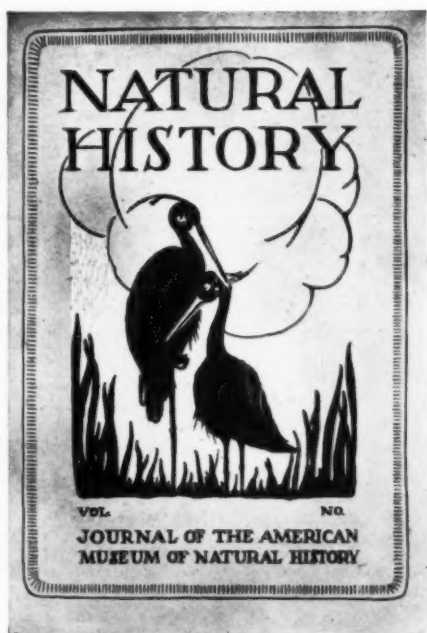
By
Elsie Willheim



By
Anne Bailey



By
M. Isaacs



By
Ideme E. McAleese



By
Miss Tonjes

Among those present were Messrs. John C. Merriam, Isaiah Bowman, J. McKeen Cattell, John M. Clarke, H. S. Graves, Vernon Kellogg, C. E. McClung, Barrington Moore, and V. E. Shelford.

FEW deaths have stirred scientific circles more profoundly than did that of John Daniel, the little gorilla, late of Ringling Brothers Circus, who departed this life on the morning of April 18, and the old-time conundrum as to who was to have the skates of the little boy who was drowned while skating sunk into insignificance before the query—who was to have the body of the gorilla.

One anatomist desired his brain, another his skull, another the feet, and still another the viscera, and an absent member of the American Museum staff was interested in the structure of the hair.

The public was eager to see him mounted and so naturally were Ringling Brothers, to whom the American Museum was already under obligations for important animals that, reposing in the study series, made no show.

Fortunately, due to the foresight of Dr. William K. Gregory, curator of comparative anatomy, the American Museum had put in a plea for John, should any unforeseen misfortune befall him, little thinking that calamity was so near. By the mutual exercise of a little self-denial, everybody was made more or less happy and the remains of poor John are being carefully studied by the group of experts referred to in the note that follows. Later it is hoped that he may, phoenix-like, rise from his (metaphorical) ashes and take his place in the hall of primates at the American Museum with his fellow great apes.

We are under obligations to Ringling Brothers for so courteously and promptly turning John over to the Museum with "no strings attached," so that he might be cared for without delay, and it may be said that already very interesting results have been obtained from the examination of details of his structure regarding the relationship of the gorilla to his more or less distant relative, man.

It is small compensation for the loss of so rare and costly an animal that he is of great interest from a scientific standpoint, but it is at least a satisfaction to know that the utmost use was made of the opportunity offered to study a fresh gorilla in New York City.

AFTER the removal of the hide of the gorilla, which will be mounted by Mr. Frederick A. Blaschke, of the staff of the American Museum, the body was dissected by Dr. George S. Huntington, professor of anatomy at the College of Physicians and Surgeons, and by his assistants. The brain was handed over to Dr. Frederick Tilney, professor of neurology and neuro-anatomy at the College of Physicians and

Surgeons, who is already well known for his researches on the anatomy of the brains of the great apes and of man. Dr. Dudley J. Morton, an orthopaedist, and Dr. William K. Gregory, curator of comparative anatomy in the American Museum, are studying the bones, muscles, tendons, and ligaments of the feet. Dr. Milo S. Hellman, an authority on the dentition and dental arches of primates and of men, will report on the dentition. Small strips of the skin and hair are being preserved for Mr. Louis R. Sullivan, assistant curator of physical anthropology in the American Museum. Casts of the head and face were made for Prof. J. Howard McGregor, research associate in human anatomy in the American Museum, well known for his restorations of primitive races of man. Several other anatomists will also take part in the investigation.

Preliminary reports indicate a number of interesting new or little known features of the anatomy. The appendix is curiously human in type, and the same is true of the kidneys, brain, and other organs. Impressions of the sole of the foot will be studied by Prof. H. H. Wilder, the Galton Society expert on palms and soles. The general appearance of the footprint, although more human than that of the other great apes, has the great toe set off from the other four toes instead of being parallel with them as in man. The delicate ridges of the sole and of the toes differ in many details from those of the ordinary human types, but Doctor Wilder has recorded a single case of a human footprint which has many characteristics of the chimpanzee, and his examination of this gorilla footprint will be awaited with interest.

PROF. J. HOWARD MCGREGOR, of Columbia University, research associate in human anatomy in the American Museum, left the Museum on May 12 on a special mission for the American Museum of Natural History and the Galton Society for the Study of the Evolution of Man. The trustees of the Museum have appropriated a sum toward the expenses of his tour of research among the museums and private collections of England, France, Belgium, Germany, Austria, and Bohemia, which contain all that has thus far been discovered of our human and prehuman ancestors. Professor McGregor carries letters to Doctor Duckworth of Cambridge, to Professor Sollas of Oxford, to Prof. G. Elliot Smith of the University of London, to Dr. Arthur Smith Woodward of the British Museum (Natural History), and to Dr. Arthur Keith of the Royal College of Surgeons in London. The most interesting early remains in Great Britain are those of the Piltdown man, which are preserved with great sanctity in the British Museum, and the Gibraltar skull in the Royal College of Surgeons. In Belgium Professor McGregor expects to study the famous

Neanderthal skeletons of Spy. He carries letters to Professors Max L'Hoest, Charles Fraipont, and J. Sèrvais, of the University of Liège. In Germany he will visit Prof. Hans Lehner, director of the Provinzial Museum in Bonn, where is preserved the original Neanderthal skeleton; in Heidelberg he hopes to examine the Mauer jaw, now in the custodianship of Dr. Wilhelm Salomon of the University of Heidelberg.

The chief center of Palæolithic remains is in the various museums and institutions of France. Here Professor McGregor looks to the friendly aid of Prof. Marcellin Boule of the Museum of Natural History, who is also director of the Institut de Paléontologie Humaine; to Dr. René Verneau, monographer of the skeletons of the Crô-Magnon and Grimaldi races; to Dr. Henri Martin; and to the distinguished archaeologists, L'Abbé Henri Breuil and Professor Doctor Capitan, of Paris, and Professor Cartailhac of the University of Toulouse. In Holland Professor McGregor will visit Prof. E. Du Bois, director of the Laboratory of Mineralogy and Geology of the University of Amsterdam, and examine the remains of *Pithecanthropus*. If time permits, he will visit Bohemia, where, besides studying materials in the University of Prague, he will examine the remarkable collections of skeletons from Predmost brought together by the late Professor Maška.

The main object of Professor McGregor's tour is to examine and compare the remains of the Neanderthal race in various museums with a view to making complete restorations of the skeletons and models of the Neanderthal figure for the hall of the Age of Man in the American Museum. For this purpose he will secure as many casts and reproductions of these precious remains as possible, supplementing these portable materials by very careful observations and measurements so as to distinguish as far as possible the true racial characters of the Neanderthal skeleton from the characters due to age, to sex, to different environmental and geographic conditions. These studies will supplement and continue those of Prof. Marcellin Boule in his masterly monograph on the skeletal characters of the neanderthaloids of France.

In connection with this tour President Henry Fairfield Osborn of the American Museum is addressing a circular letter to the heads of the above and other similar institutions on the continent of Europe, announcing that the research materials in the American Museum collections are now open to the freest examination and study by accredited students of palæontology, anthropology, and comparative anatomy from all parts of the world, and that the Museum desires to secure equal facilities in the museums of other countries. The best means of reëstablishing helpful relations among

the nations of the world is by opening these international treasures to all duly accredited students and investigators. It is understood that every investigator comes with a guarantee of his personal character and integrity and also of scientific attainment sufficient to enable him to make proper use of the materials extended to him. It is further understood that material which has not been monographed or described is made available by courtesy and that no advantage will be taken by the prior description of unpublished material. It is also understood that all materials that have been monographed and described are freely open to the students of the world. This is what our great national and international museums are created for.

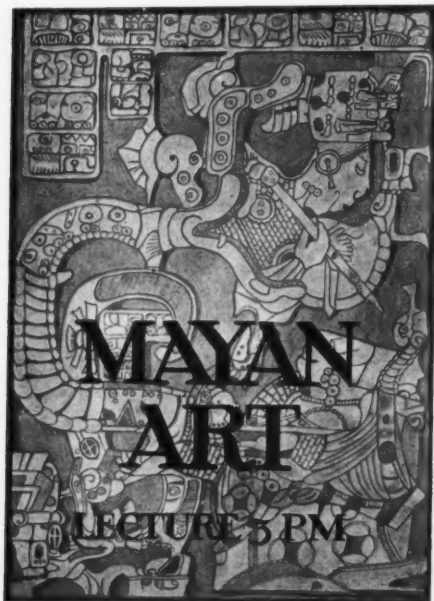
A SERIES of five lectures arranged by the American Museum for the Boy Scouts of the metropolis and delivered by members of the staff was completed on May 14. Dr. G. Clyde Fisher opened the series on March 19 with an account of "Wild Animals Near Home." On April 2 Mr. Herbert P. Whitlock spoke on "Water in the Atmosphere," which was followed on April 16 by Mr. James P. Chapin's "Bird Study for Scouts." "Scouting for Insects" was the subject of Dr. Frank E. Lutz' address on April 30. The completing lecture was given by Dr. Chester A. Reeds on "Geology in and about New York City."

THE Reverend Harry R. Caldwell, who rendered such practical assistance to Mr. Andrews on the First and Second Asiatic Expeditions of the American Museum, has sent to that institution from China a collection of three hundred and fifty mammals, including an exceptionally fine tiger skin. Mr. Caldwell recently returned to his duties at the Methodist Episcopal Church Mission in Yenping, Fukien, China. In February Mr. Caldwell started on a five weeks' itinerary through his conference, expecting to walk nearly three hundred and fifty miles. Traveling in Yenping is necessarily done on foot except for an occasional boat trip and such long walking expeditions afford splendid opportunities for collecting. Mr. Caldwell, who is a remarkably successful trapper and accurate marksman, always carries his butterfly net and rifle with him. His avocation and his profession supplement each other still further inasmuch as the missionary's ability to rid a neighborhood of the tigers lurking in its ravines has won for him the gratitude of the villagers. It is Mr. Caldwell's hope to secure for the American Museum this summer one of the large badgers to be found on the rolling uplands of Yenping.

An interesting series of posters devoted to the red man and his arts has recently been on exhibition in the hall of the Southwest Indians on the



A representation of a *kachina*, or supernatural being, revered by the Hopi Indians of the Southwest. To children are given wooden figures of this kind, which are both playtoy and means of instruction, familiarizing the little ones in time with the many gods of the Hopi pantheon



The serpent, often represented with a human head projecting from its mouth, is a favorite theme of Mayan art. At first of totemic significance, the snake became in time a sign or attribute of divinity in general

ground floor of the American Museum. These posters, made by students in the second year advertising class at the New York School of Fine and Applied Art, and based to a large extent on material in the collections of the American Museum, represent a variety of different subjects including designs borrowed from Mayan art, Hopi kachinas, masks of the false-face society of the Iroquois, and the implements and arts of the West Coast Indians and of the Plains Indians. The artistic effect of these posters is as fine as the purpose is commendable of familiarizing the public in this way with the customs and achievements of the aborigines. Some of the competing students are ex-service men, working under the direction of the Federal Vocational Board.

A CORRESPONDENT, Major J. R. Whitaker, writing from Grand Lake, Newfoundland, calls attention to a fact which some of the zoölogists of the American Museum have overlooked, namely, that the great mural in the hall of the Age of Man representing the migration of the reindeer and the mammoth cannot be described as of early spring, because the reindeer are still carrying their antlers. In response to an inquiry as to what time the Labrador and Newfoundland reindeer drop their antlers Major Whitaker writes (April 26, 1921) as follows:

"The fully mature bulls shed their antlers usually between November 5 and 15 and the younger ones a little later. A three-year-old stag will sometimes carry his until about Dec. 15, but that is late. A pricket will often not drop his until towards the end of December, and the cows carry theirs until well on in April. I once saw a cow with an 18-point head on April 20. This, of course, was an exceptional head for a female; however, I have heard of one being killed here with thirty-six points.

"About fifteen years ago there were quite a lot of caribou in this country. The main migration passes close to my place and I used to see large numbers go by every fall. We used to think it a very poor day if we did not see from one hundred to four or five hundred moving over some large tundra. The spring migration is a much more leisurely affair. The stags and does with no fawns go north directly the snow melts. Many does remain on the high barrens south of the lake until they have their young, then move north. These you see passing up to about July 20. There are quite a number of caribou which live in the southern part of the island and never come north at all."

It will be necessary, therefore, to change the legend on this mural to "A Late Autumn Migration of the Reindeer and Mammoth along the River Somme," because there is no question that the reindeer in Pleistocene times shed their antlers exactly at the same season of the year as they do now. This error, now corrected by Prof. Henry Fairfield Osborn, is an

instance of how easy it is to slip into a seasonal anachronism and how difficult it is to assemble all the facts for the restoration of conditions in the remote past. Each of these murals is to be regarded as a trial hypothesis subject to development and correction from time to time as fresh discoveries are made and learned criticism and suggestions like those of Major Whitaker are received.

The mural representing the early Neolithic stag hunters, at the western end of the hall, has by way of encouragement, received some recent confirmation in one very important particular, namely, the racial characters of the men of the Campignian Age. In designing this mural Professor Osborn ventured to assign the Campignian culture of northern France to early members of the fair-haired northern race arriving in northern Europe. Marcellin Boule, in his recent work, *Les Hommes Fossiles*, partly assents to this opinion. The veteran Swedish archaeologist, Montelius, writing in the *Antiquarian*, traces the Campignian culture into Denmark and possibly into Sweden and expresses the very positive opinion that these people were the direct ancestors of modern Scandinavians and, consequently, of the Nordic race.

These murals not only have been seen by thousands of visitors since they were begun four years ago, but they are now sending their information all over the world through the pages of *L'Illustration*, *London Illustrated News*, *New York Times*, *Midweek Pictorial*, and *Nature*. In the issue of the last mentioned weekly for April 21, 1921, Professor Osborn has re-described the hall of the Age of Man as it now appears. Director F. A. Lucas is issuing a special *Guide Leaflet* descriptive of this hall, based on the article which appeared in the May-June, 1920, number of *NATURAL HISTORY*.

In the meantime the Neanderthal group has been completed by Mr. Charles R. Knight and is placed over the east doorway. To the right of this are four spaces for murals, which will be devoted entirely to the fauna of the Rancho-la-Brea, the famous tar pools of southern California, including especially the sloths, the imperial mammoths, the saber-toothed tigers, and the wolf of the period in the first large mural of the eastern wall. In studying the mammals for this composition the Museum is greatly aided by the personal direction of Prof. John C. Merriam, to whom the world is principally indebted for our knowledge of this wonderful fauna. It is planned to complete this mural during the present year.

MR. ROLLO H. BECK, leader of the Whitney South Sea Expedition, has recently sent to the American Museum two shipments of specimens from the field. One of these, comprising the birds collected at Tahiti, has not yet arrived, but the other, representing about 340 skins and

a series of nests and eggs from Christmas Island and the Marquesas Archipelago, reached the Museum in April, together with a set of photographs from the same localities. This material proves to be of high scientific value and for the most part the species are new to museum collections in the United States.

The land birds number several species which are rapidly being exterminated by the mongoose and by other agencies in Polynesia, and which, therefore, it might not be possible to obtain a few years hence. Among them are two species of fruit pigeons, several kinds of Old World flycatchers, including the warbler which is peculiar to Christmas Island, as well as kingfishers, swifts, etc.

The water birds include three species of boobies, two of tropic birds, one of the man-o'-war bird, seven of terns, five of petrels, and many more. Among them are several quite new to the collections of the American Museum of Natural History. Particularly noteworthy are the series of a rare white-breasted petrel, known as *Fregatta albigularis*, splendid series of the ghost tern (*Gygis*), the extremely rare blue ternlet (*Procelsterna*), and four breeding examples of a species of man-o'-war bird described by Gmelin in the eighteenth century but not previously represented in America except by one or two immature examples. All these, as well as the specimens of the red-tailed tropic bird—one of the most beautiful of all sea birds—include examples in all stages of growth from newly hatched chicks to fully mature birds, and it is almost needless to add that in quality and exactness of the accompanying scientific data, the specimens are of the usual standard of the material collected by Mr. Beck. They should form the basis of important work in both ornithological classification and zoogeography.

The latest word from Mr. Beck is contained in two letters dated March 17, the day before he was to start for the Austral Islands and Rapa, to be gone about a month. This phase of his work ought to prove especially worth while, for it will take him south of the region of South Equatorial Drift into a zone where winds, ocean currents, and the temperature of the waters are all different from those of the region in which he has been working. The fauna should also show a corresponding difference, and we may confidently expect a shipment of specimens of equal excellence after his return.

THE sixth annual meeting of the American Society of Ichthyologists and Herpetologists was held Tuesday, March 8, 1921, at the Academy of Natural Sciences, Philadelphia, Pennsylvania. Dr. E. W. Gudger and Mr. Henn of the department of ichthyology, and Mr. G. K. Noble and Mr. Camp, of the department of herpetology represented the American Museum of Natural History. Among the interesting

papers presented were: "Snakes Swallowing Their Young in Ancient Fable," by F. G. Peck; "Notes on the Habits and Morphology of the Nurse Shark," by Dr. E. W. Gudger; "Some Notes on Amphibians Collected in China in 1920," by H. H. Wilder (presented by Miss L. Smith); "Some Remarks on a New Method in the Study of Bone and Cartilage as Applied to Herpetology," by G. K. Noble; "Some Observations on Local Amphibians and Reptiles," by J. F. Street; and "The Fishes of Butler County, Pennsylvania," by H. W. Fowler.

The next meeting of the Society is to be held in conjunction with the American Society of Mammalogists, which meets with the American Society of Ornithologists. It will be the first occasion on which all groups of vertebrate zoologists will meet together.

THE Irwin Expedition of Indiana University, consisting of Dr. C. H. Eigenmann, Miss Adele Eigenmann, and Dr. William Ray Allen, devoted the period from June, 1918, to June, 1919, in part to the collecting of fishes in the highlands of Peru. In May, 1920, Doctor Allen started, without English-speaking associates, on the Centennial Expedition of Indiana University for the purpose of extending the survey of the fish fauna to the lower levels of the rivers of eastern Peru. The plan pursued by the latter expedition was to collect exhaustively from a few representative localities in the river basins, for the most part within the great Department of Loreto.

In addition to shorter sojourns and trips, ten days were spent at Puerto Bermudez, and a month in the vicinity of Contamana on the lower Ucayali; a fortnight was devoted to the Puinahua and Pacaya, and another two weeks to the region of the Iquitos. A cruise a month in duration was made along the upper Marañon from Iquitos to the Pongo de Manseriche, and along the tributaries, Tigre and Morona. An examination of the lower Huallaga was made possible by a sojourn of three weeks in the region of Yurimaguas.

A large number of families of fishes and of aquatic mammals are represented in the waters of this region, many species of fish from the lower Amazon becoming distributed to the very foot of the Andes and throughout oriental Peru.

INTERESTING news has been received in connection with the excavations that are being made at Aztec, New Mexico, by Mr. Earl H. Morris with the aid of the Archer M. Huntington Fund. It has been known for a long time that the interior court of this ruin contained a great kiva, more than forty feet in diameter. This kiva has now been excavated and proves to be a very interesting structure indeed. It has a tier of rooms around it in circular formation, thus resembling a wheel. The most in-

teresting point, however, is that underneath this kiva was an old structure apparently belonging to the first building at Aztec. From this were taken about 200 pounds of pottery fragments, from which it will be possible to reconstruct thirty or more complete vessels. The impressive thing about this pottery is that it is precisely of Pueblo Bonito type. Not only is the common run of pottery found at Pueblo Bonito represented in this collection, but from the debris were taken two effigy vessels, one representing a deer and the other a seated hunch-backed figure similar to those found at Pueblo Bonito by Mr. George H. Pepper. The discovery of this pottery, therefore, quite clears up the chronology of this ruin, showing without a doubt that it was established by people from Pueblo Bonito or the neighboring ruins and is, accordingly, of later origin than the ruins in the Chaco Cañon.

Mr. Earl H. Morris has under preparation a full report on this most recent find, which will be ready for publication shortly.

The large collection of pottery obtained last year from the neighboring site on the Navajo Reservation is now on its way to the American Museum and arrangements have been made for the excavation of the same site. There are good reasons for expecting a very large collection.

THE Founder's Medal of the Royal Geographical Society has been awarded to Mr. Vilhjalmur Stefansson "for his distinguished services to the Dominion of Canada in the exploration of the Arctic Ocean," and the Patron's Medal to General Bourgeois, Senator for Alsace "for his long and eminent services to geography and geodesy." At the foundation of the Royal Geographical Society, William IV granted an annual donation of fifty guineas as a premium for the encouragement and promotion of geographical science and discovery. From 1832-35 those honored with the award received the sum in money; since 1836, however, gold medals have usually, though not invariably, been bestowed instead. The Founder's Medal bears on the obverse side the portrait of the Founder, King William IV; the Patron's Medal has impressed upon it the portrait of the reigning monarch.

Other awards made at the same time were as follows: the Murchison grant to Commandant Maury, for his surveys in the Belgian Congo; the Bach grant to Miss Marian Newbigin, in recognition of her contributions to geography, especially to the geography of the Balkans; the Cuthbert Peek grant to Captain J. B. L. Noel, for his reconnaissance of the eastern approaches of Mount Everest and other geographical accomplishments; and the Gill Memorial to Lieutenant Colonel M. N. MacLeod, R.E., for his contribution to the theory of survey from air photographs.

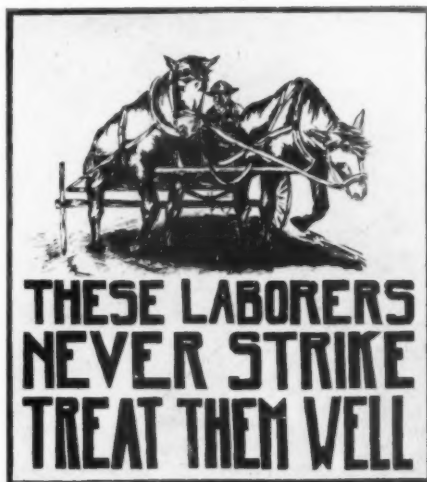
On the third floor of the American Museum there has recently been on exhibition a series of posters urging humane treatment of animals. The posters are the work of pupils of the elementary schools of Greater New York and were submitted in the Humane Education Poster Contest held under the auspices of the New York Woman's League for Animals, in which the late Mrs. James Speyer took a keen interest. The prize-winning drawings and many, too, which failed to achieve that distinction, are interesting not only from the standpoint of execution but also from that of their conception, which has a freshness often lacking in the more labored efforts of adult draftsmen. All of the posters express that love for dumb brutes which is such a pleasing trait in children.

The poster by Fred Fountain, grade 4 B, Public School 94, Queens, to which was awarded the first prize in class I, is an original assemblage of colored cut-outs pasted on a paper background. It represents a horse and a turkey separated from each other by a fence, with a fringe of grass in the foreground. The first prize in class II was won by a pupil named Aventiniglio, in grade 8 A, Public School 40, Manhattan. The Subject is "Willing Workers" and represents three horses pulling abreast. A pleasing fancy is revealed in the sketch by Ethel Plate "Love All Pets," which depicts a rabbit and a bird seated at opposite ends of a neatly spread table, the one with a carrot before him, the other with a bowl. A drawing of a caged rhinoceros by David Cohen, Public School 175, Brooklyn, carries the caption, "How would you like to be caged far away from home?"

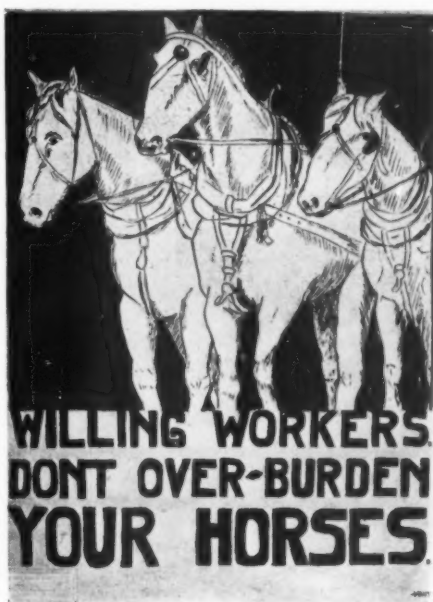
JOHN BURROUGHS' son, Julian Burroughs, and Dr. Clara Barrus, literary executor of the John Burroughs estate, have given their endorsement to a plan for a Memorial Association to take over and care for Slabsides, Riverby, and Woodchuck Lodge (the three places most closely associated with the life and writings of the poet-naturalist) and the Memorial Field, where the mortal remains of Burroughs lie buried.

A call for a meeting of Burroughs' friends, for the purpose of selecting a Memorial Committee, was sent out by Prof. Henry Fairfield Osborn, Dr. Frank M. Chapman, Dr. G. Clyde Fisher, Mr. Carl E. Akeley—all of the American Museum—and Mr. Hamlin Garland, Dr. Clara Barrus, Mr. Kermit Roosevelt, Mr. Irving Bacheller, Mr. W. Ormiston Roy, and Mr. Edwin Markham.

The meeting was held at the American Museum on April 15, and was attended by a large number of Burroughs' friends. On resolution of Mr. Garland, a committee of nine was chosen to have the organization incorporated as a Memorial Association, devoted to the purpose of acquiring and preserving the places associated



An effective poster, with a striking caption, that arrested the attention of visitors to the recent exhibit.



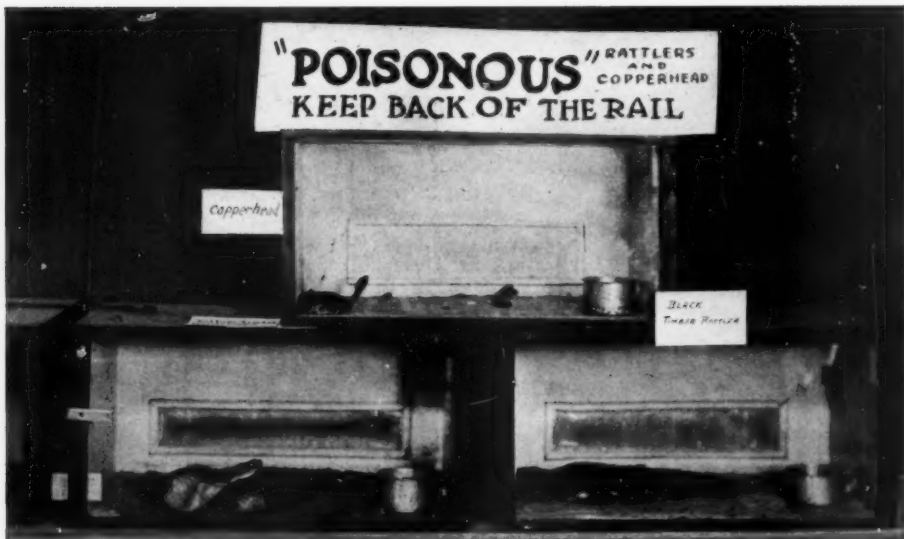
To this poster was awarded the first prize in class II of the Humane Education Poster Contest. Design by a pupil named Aventiniglio

with the memory of Burroughs and of promoting and extending his spirit and teachings.

The members of the committee are: Doctor Chapman, chairman; Dr. G. Clyde Fisher, Mr. Hamlin Garland, Mrs. Henry Ford, Mrs. Thomas A. Edison, Judge A. T. Clearwater, Mr. Kermit Roosevelt, Mr. Carl E. Akeley, and



Interior of a natural history museum established through the cooperative effort of boys enrolled in the summer camp in the Interstate Park. On the table to the left are specimens of their taxidermy



An interesting section of the museum was that devoted to live snakes, including not a few that had to be labeled "handle with care"

Mr. W. Ormiston Roy. The organization, now incorporated, is ready to begin active work.

THE memory of John Burroughs can be honored in no more fitting way than by assuring to posterity the kind of influences that were so deep an inspiration to him. Of happy significance, therefore, is the memorial offered the great naturalist by the Conservation Commission of New York State in coöperation with the Raymond Riordan School, located at Highland, Ulster County, New York. By the boys of this school there will be planted this year on state lands near Big Indian in the Catskills, not far from the place where Burroughs was born, no less than ten thousand trees, which will constitute the nucleus of a forest that will be enlarged by additional plantings year after year. The work was begun by the boys on April 17.

How a museum may be built up through the coöperative effort, wisely directed, of a group of youngsters is illustrated by the Boy Scout Museum established at Kanohwahke Lakes, Interstate Park, New York. On the three lakes with contiguous shore line that constitute this group are located eighteen camps, each on an average composed of one hundred boys. The problem of interesting the boys, whose stay in many cases is limited to two weeks, in natural history, early presented itself to the directors in charge. They hit upon the happy plan of building up a natural history museum by enlisting the boys to collect the specimens for the exhibits. Such a suggestion was a great incentive and served the double purpose of creating a center for the study of nature and at the same time of teaching natural history in the course of its establishment. Real zest developed when the boys realized that they were building a museum which actually belonged to them and which was expanding due to their individual and united effort.

The leaders in this movement were selected from boys whose stay in camp was to extend throughout the summer. These in turn brought into the group the boys who were to do the field collecting. A small library was acquired and the end of the season witnessed an exhibit of which the boys had every reason to be proud. With such good results was the experiment attended that those arriving late in the summer, when the museum was in full development, were constantly asking for leave to visit it, and many earned points for their camp emblem by study of the specimens in the museum as well as by field observations.

A very creditable mineral collection was made, the dumps of the old iron mines providing a valuable source of supply.

The American Museum interested itself in the undertaking and loaned a collection of the birds

of the park and other nature exhibits in cases. The New York Zoölogical Society loaned a good collection of snakes. With these acquisitions the central pavilion took on a real museum atmosphere.

The coming season at Kanohwahke Lakes promises to be one of great activity, supported financially by the Interstate Park Commission and by the Boy Scout camps. The sum secured from these sources will make possible a permanent scientific staff of at least four experts in the natural sciences. On the evenings of Wednesday and Saturday of each week visiting scientists will give the boys informal talks. Special hikes will also be organized under these auspices. In addition six young naturalists and certain Boy Scouts who have shown special proficiency in nature study and in the instruction of others will help in the work.

THE period of May 22-28 was set apart by proclamation of the President of the United States as Forest Protection Week, during which citizens were requested to do their utmost to bring before the people at large the serious effects of the present unnecessary waste by forest fires, and the need of individual and collective efforts in conserving the natural resources of America. Thirty-three thousand or more forest fires occur each year, involving a loss of approximately \$20,000,000 and about 12,500,000 acres of timberland. A large percentage of these fires can be prevented through the exercise of greater care and vigilance.

THE National Academy of Arts and Letters, of which John Burroughs was an honored member, will hold a John Burroughs memorial meeting on the afternoon of Tuesday, November twenty-second. This meeting will be similar to those held in honor of William Dean Howells and other members of the Academy who have recently passed away. Professor William M. Sloane, president of the Academy, has invited President Henry Fairfield Osborn of the American Museum, to deliver one of the addresses on the occasion. The other speakers selected are Dr. Frank M. Chapman, curator of ornithology, and Messrs. Bliss Perry and Hamlin Garland.

MR. DAVID CHARLES DAVIES succeeds the late Dr. Frederick Skiff as director of the Field Museum, Chicago. Mr. Davies has been connected with the museum for no less than twenty-seven years and has worked in close association with Doctor Skiff, whose assistant he was. He superintended the removal of the museum exhibits from the building in Jackson Park to their imposing new quarters in Grant Park.

MR. J. REID MOIR, of Ipswich, England, has recently made a collection in book form of his

writings on pre-Palaeolithic man, to which he has added some new material. He takes up the much discussed question of the evidence of human handiwork on the pre-Palaeolithic flints—the so-called *coliths*—which have been dug up in great numbers in England. Mr. Moir endeavors to show by chipping experiments of his own that these flints could not have received their present form through accidental fracture or pressure.

Mr. Moir, it will be recalled, has been active for more than a decade in the discovery and discussion of evidence bearing on the "Eolithic problem" or, in other words, on the question of the existence and activity of man during Tertiary times. His name is especially linked with the supposedly intentional type of flint implement known as the *rostror-carinate* or "eagle beak," found at the base of the Red Crag formation of Pliocene date, in Suffolk. The authenticity of this implement is championed by no less a personage than Sir Ray Lankester, and if this opinion should prove correct, the find is the oldest surviving evidence we have of the intelligent expression of the human mind. Mr. Moir has also discovered in and about Ipswich a human skeleton beneath the chalky boulder clay, as well as several open Aurignacian and Magdalenian floors with hearths and worked flints. He was one of the authorities to pass judgment on the supposed implements found with the Piltdown man. These he distinguished as Eolithic and pre-Chellean.—N. C. N.

THE disastrous famine that is today decimating the Chinese provinces of Honan, Shensi, and Chihli, is due, according to foresters of the United States Department of Agriculture, to the wanton destruction of the forests and the failure to take any steps toward reforestation. Where formerly tree-covered mountains absorbed much of the annual rainfall and regulated the stream flow, so that there was throughout the year a steady supply of clear water, today a treeless, shrubless, and even grassless soil offers no resistance to the roaring torrents which in times of rain replace the shrunken streams of

muddy water that trickle down through the rest of the year. Crops cannot grow under conditions such as these and people starve.

Once upon a time the Hwang or Yellow River, which drains a large part of the famine-stricken region, flowed through a fertile valley, the hills adjacent to which were well wooded. Today the river is for most of the year a moving quicksand, its water reduced to a minimum. When the floods come, the aspect of the land is completely changed. In 1886 this river, which is known as "China's Sorrow," flooded about 20,000 square miles of territory, sweeping away thousands of villages and towns and taking a toll of 2,000,000 lives.

The plight of China may serve as a warning to the rest of the world. A country that squanders its natural resources is ultimately doomed to decadence.

THE Hon. Herbert Hoover, Secretary of Commerce, invited investigators, administrative officers, and all other interested persons to meet June 8-10 at the Fisheries Biological Station, Fairport, Iowa, for a conference regarding the conservation of resources of interior waters and the ways and means of applying science more effectively to their preservation and increase. With the growth of population and the development of industrial communities along the rivers and lakes of our country, the public waters have become increasingly unfit as places of abode for the fish and other forms of life to which in the past they offered sanctuary. To ascertain whether such a condition of things is avoidable and, if so, what steps can be taken to effect improvement, was the purpose of the conference.

The gathering provided for full and general discussion, which might be from the points of view of coöperation in scientific research, the training of men to prosecute investigations, the education of the public, the reconciliation of conflicting group interests, the union of effort to secure adoption of appropriate conservation measures, and the possibility of periodic gatherings for promotion of harmonious action.

"NATURAL HISTORY"

THE JOURNAL OF THE AMERICAN MUSEUM

RETROSPECT AND PROSPECT

NATURAL HISTORY, entering its twenty-first year, is coming of age. During 1921 it will appear as a bimonthly, beginning with the issue of January-February. It will continue to represent exploration, all branches of natural history, anthropology, nature education, and the ever vital cause of the conservation of the beauty of the world's forests, flowers, and animal life.

Among the articles in train for early publication are "Rancho-la-Brea" and "The Restoration of Extinct Animals" by Henry Fairfield Osborn; "Experiences in a Volcano Observatory" by T. A. Jaggar, Jr., of the Hawaiian Volcano Observatory and "The Great Extinct Volcano, Haleakala," by E. O. Hovey, curator of geology and invertebrate palaeontology, American Museum, both articles accompanied by impressive illustrations; "The Cordilleran Ice Sheet" by L. C. Read, whose splendid pictures of Llewellyn Glacier will be recalled by readers of the magazine; "Wind and Rain as Influences on the Development of Life in Southern Ecuador" by H. E. Anthony, associate curator of mammals of the Western Hemisphere, American Museum; "Some Little Known Songs of Common Birds" by Francis H. Allen; "Phosphorescent Animals and Plants" by Ulric Dahlgren, director of the Harpswell Laboratory; "Nature Study with the Microscope" by Phillip O. Gravelle; "The Part Played by Fish in the Control of Yellow Fever" by Dr. Michael E. Connor, of the International Health Board of the Rockefeller Foundation; "Nature Study in a Summer Camp" by G. Clyde Fisher, associate curator, department of public education, American Museum; "The Artistic Anatomy of Trees" by John W. Harshberger, professor of botany, University of Pennsylvania; "Pitcher Plants and Their Moths" by Frank M. Jones; "Pictures of Miocene Fish" by David Starr Jordan; "The Staten Island Museum" by Charles W. Leng, its director; "A Women's Ceremony among the Hopi" by Robert H. Lowie, associate curator of ethnology, American Museum; "Urus and Bison" by W. D. Matthew, curator of vertebrate palaeontology in the American Museum; "The Geology of New York City and Its Environment" by Chester A. Reeds, associate curator of invertebrate palaeontology, American Museum; articles on Indian Corn by Charles W. Mead and Henry M. Steece; "Making Naturalists in Norfolk Street" by Mrs. John I. Northrop; "The Miami Aquarium" and "What Sharks Really Eat" by John T. Nichols, associate curator of fishes, American Museum; "The Search for the Marsupial Frog" by G. K. Noble, assistant curator (in charge) of herpeto-

logy, American Museum; "How Diamonds are Polished" by Herbert P. Whitlock, curator of mineralogy, American Museum.

Several of our most distinguished contributors during the last twenty years, like Peary and Roosevelt, have passed away, but their memory and inspiration will be kept alive through the work and writings of the younger men whom they have inspired. Among those whose articles have appeared in NATURAL HISTORY in the past are numbered the following:

EXPLORERS AND NATURALISTS

Carl E. Akeley	W. Elmer Ekblaw
Malcolm P. Anderson	Adolphus W. Greeley
Roy C. Andrews	William T. Hornaday
H. E. Anthony	Ellsworth Huntington
Rollo H. Beck	Herbert Lang
William Beebe	Donald B. MacMillan
Herbert L. Bridgman	Leo E. Miller
Barnum Brown	Robert Cushman Murphy
James P. Chapin	Henry Fairfield Osborn
Frank M. Chapman	Robert E. Peary
George K. Cherrie	Knud Rasmussen
James L. Clark	Theodore Roosevelt
Henry E. Crampton	Vilhjalmur Stefansson

ZOOLOGISTS AND ANATOMISTS (Mammals, birds, fishes, reptiles)

Joel A. Allen	Raymond L. Ditmars
Alfred M. Bailey	Charles E. Eastman
Thomas Barbour	David Starr Jordan
Ernest Harold Baynes	Frederic A. Lucas
John Burroughs	C. Hart Merriam
Eric Dahlgren	Thomas S. Palmer
Bashford Dean	Hugh M. Smith
Ned Dearborn	R. W. Tower
Mary Cynthia Dickerson	Charles H. Townsend
	Walter Winans

ANTHROPOLOGISTS (Evolution of Man)

Franz Boas	J. Howard McGregor
M. D. C. Crawford	Frederick W. Putnam
George T. Emmons	Marshall H. Saville
William K. Gregory	G. Elliot Smith
Pliny E. Goddard	Harlan I. Smith
Alfred L. Kroeber	Herbert J. Spinden
Berthold Laufer	Louis R. Sullivan
Robert H. Lowie	Clark Wissler
George Grant McCurdy	Robert M. Yerkes
	N. C. Nelson

BIOLOGISTS
(Marine and Insect Life)

T. D. A. Cockerell	Frank E. Lutz
Edwin G. Conklin	Alfred G. Mayor
G. Clyde Fisher	Roy W. Miner
Frank R. Lillie	John K. Small
Leo Loeb	William Morton Wheeler

FOREST LIFE AND CONSERVATION, BOTANY

Charles C. Adams	Mary Cynthia Dickerson
William F. Badè	Henry S. Graves
Edward W. Berry	Barrington Moore
Mrs. N. L. Britton	William A. Murrill
John B. Burnham	T. Gilbert Pearson
John M. Coulter	George W. Perkins
	George D. Pratt

EDUCATION, HISTORY, BIOGRAPHY, SOCIOLOGY,
AND PUBLIC HEALTH

Maurice A. Bigelow	Walter B. James
L. H. Bailey	Douglas W. Johnson
Allan Brooks	Robert Underwood Johnson
Joseph H. Choate	William W. Keene
Frank S. Dellenbaugh	Graham Lusk
John M. Finley	William H. Maxwell
Hamlin Garland	

George Bird Grinnell	Mrs. John I. Northrop
Hermann Hagedorn	William E. Ritter
Walter G. Holmes	George H. Sherwood
Charles-Edward A. Winslow	

GEOLOGY, GEMS, MINERALS

Charles R. Berkey	Edmund Otis Hovey
John M. Clark	Charles R. Van Hise
L. P. Gratacap	George Frederick Kunz
R. A. Harris	Herbert P. Whitlock

PAST HISTORY OF THE EARTH—PALEONTOLOGY

Robert Brown	William Diller Matthew
Amadeus W. Grabau	Henry Fairfield Os- born
Walter Granger	

ASTRONOMY, PHYSICS

Howard Russell Butler	Sylvanus G. Morley
S. A. Mitchell	Michael I. Pupin
	Elihu Thomson

ART AND ARCHITECTURE

L. A. Fuertes	Sigurd Neandross
Charles R. Knight	Will S. Taylor
Howard McCormick	S. Breck Trowbridge